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# THE EFFECTS OF FAST DECLINE IN CRUDE OIL PRICES ON THE TANKER MARKET IN THE SHORT RUN*

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***ABSTRACT***

*Oil prices have been steadily declining to around $27 since early 2016, while it was at around $120 in early 2013. This decline will surely have an effect on countries' petroleum demands. Oil transport by sea, one of the most important instruments of international oil trade, has also been directly influenced by these developments. The supply curve is inelastic in the short term and sudden demand increase in the tanker market has also caused sudden rise in freight rates. Since the entrance of the new transport capacity into the market lasted for approximately 3 years, this study examines a period of about 3 years and tries to examine the effects of oil prices on the tanker market in the short run. The purpose of this study is to contribute to the existing theory by examining the effects of this extraordinary decline in the recent era. In this study, the tanker market is divided into freight, new construction, second hand and scrap market, and each sub-market is examined separately. Correlation analysis has been used as the method of study. According to the findings, freight market and second hand market have been affected positively by the decrease of oil prices. However, the impact of the fall in oil prices on the new construction market has not been at the expected level. When the effects on the scrap market were examined, a relationship has been found in the positive direction as the opposite of the theory and the hypothesis.*

***Keywords:*** *Tanker industry, oil price, short run effect, four shipping markets, correlation analysis.*

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# HAM PETROL FİYATLARINDAKİ HIZLI DÜŞÜŞÜN TANKER PİYASASINA KISA DÖNEMDE ETKİLERİ

***ÖZET***

*Petrol fiyatları, 2013 yılının başlarında yaklaşık 120$ seviyelerinde seyretmekte iken, 2016 yılının başlarına gelindiğinde 27$ seviyelerine kadar istikrarlı bir şekilde düşüş göstermiştir. Bu düşüşün, ülkelerin petrol taleplerini arttırıcı bir etkisinin olacağı muhakkaktır. Uluslararası petrol ticaretinin en önemli araçlarından biri olan denizyoluyla petrol taşımacılığı da, bu gelişmelerden doğrudan etkilenmiştir. Tanker piyasasında kısa dönemde arz eğrisi inelastiktir ve ani talep artışları navlunlarda da ani yükselmelere neden olmaktadır. Piyasaya yeni taşıma kapasitesinin girmesi yaklaşık 3 yıl sürdüğü için, bu çalışmada yaklaşık 3 yıllık bir süreç incelenmiş ve kısa dönemde petrol fiyatlarının tanker piyasasına etkileri incelenmeye çalışılmıştır. Bu çalışmanın amacı mevcut teoriye, yakın dönemdeki bu olağanüstü düşüşün etkilerini inceleyerek katkıda bulunmaktır. Çalışmada tanker piyasası, navlun, yeni inşa, ikinci el ve hurda piyasası olarak bölümlendirilmiş ve her alt piyasa ayrı olarak incelenmiştir. Çalışmanın yöntemi olarak korelasyon analizi yöntemi kullanılmıştır. Bulunan bulgulara göre navlun piyasası ve ikinci el piyasası petrol fiyatlarının düşüşünden çok olumlu yönde etkilenmişlerdir. Ancak petrol fiyatlarının düşüşünün yeni inşa piyasasına etkileri beklenen düzeyde olmamıştır. Hurda piyasasına olan etkileri incelendiğinde ise, teorinin ve hipotezin tersi bir durum olarak pozitif yönde bir ilişki saptanmıştır.*

***Anahtar Kelimeler:*** *Tanker piyasası, petrol fiyatı, kısa dönem etki, dört denizcilik piyasası, korelasyon analizi.*

## 1. INTRODUCTION

Oil has a vital role in our lives. There is an extreme need for oil in many sectors as well as in the service sector. So dependence on oil has reached the highest levels in the history especially recent years. Researches for alternative energy resources have been carried out against this extra dependence. 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.

Transportation of oil is mainly carried out in two ways: by seaborne and by pipeline. Pipeline transportation needs geographical and political harmonies and can be used as a trump by creating a dependency. But seaborne transportation is flexible and optional. Thus, international seaborne oil transportation keeps it weight in the oil market.

Seaborne oil transportation is derived demand as maritime industry. So it is affected by fluctuations in the oil market. These fluctuations may be caused by political crisis, economic crisis and commodity prices. Therefore, there are many cycles in the tanker market in the history, and the last one is triggered by extra ordinary fall of oil prices. This possible cycle is the subject of this study.

Short run supply curve in the tanker market is inelastic because of leading time in shipbuilding industry. So, instant increase on demand causes instant rise in freight levels. Therefore, expected increase on oil commodity because of its decreasing trend will cause positive effects on the tanker market.

This study examined a period of about 3 years and tried to examine the effects of oil prices on the tanker market in the short run, because entrance of new capacity to the market takes 2 or 3 years. The purpose of this study is to contribute to the existing theory by examining the effects of this extraordinary decline in the recent era. In this study, the tanker market is divided into freight, new construction, second hand and scrap market, and each sub-market is examined separately.

The next section examines the theoretical background of the investigation that also includes hypothesis of the study. Then similar studies in the literature are mentioned. After methodological activities are implemented, contribution of the study is presented in the conclusion and discussion section.

## 2. THEORETICAL BACKGROUND

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). Freight levels are the main determinants of conditions in other maritime markets.

Freight rates are determined by interaction of supply and demand in maritime market (Stopford, 2009: 160). The short run supply schedule is shaped as revers “L” for tanker shipping market. When there is a low

demand for tanker services, it is very elastic. But it becomes very inelastic as demand closes to 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 closes to the potential maximum productive capacity of the current 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). As seen at the Figure 1, approximately 20% of the world tanker fleet consists of old and obsolete ships. Their operational activities depend on the market conditions. The curve also represents the average total costs of the ships.

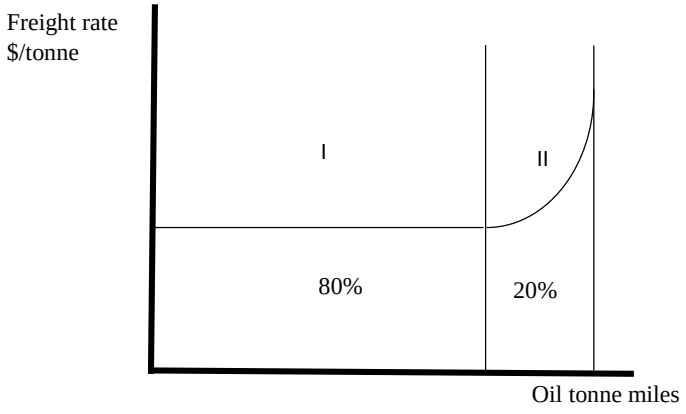


**Figure 1:** Short Run Supply Curve for Tanker Services
Source: Grammenos, 2010: 379

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 ($H_4$). In the meanwhile, demand for shipbuilding increases which causes a pressure on yards. So newbuilding prices apt to rise ($H_3$). Thus freight rates, second hand prices, scrap prices and newbuilding prices will tend to move together in a cyclical trend ($H_2$). They affect 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 in Figure 2. 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 Dl, 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 Dl 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 ($H_1$). 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).

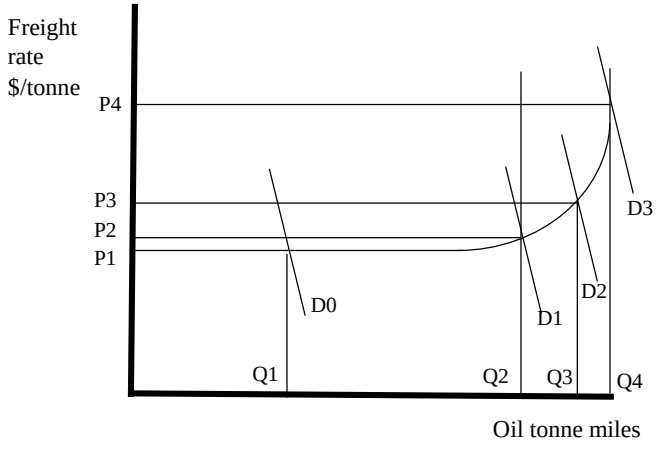


**Figure 2:** Modelling Tanker Demand and Supply in the Short Run
Source: Grammenos, 2010: 381

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).

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 is 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).

These dynamics in the market causes shipping cycles in the history. Duration, size and intensity of these cycles vary by their eras. Analysis of short cycles over the period 1741–2007 illustrates the 'work pattern' of the shipping cycle. There were 22 cycles, averaging 10.4 years each (Stopford, 2009: 134). The Figure 3 shows these cycle stages.

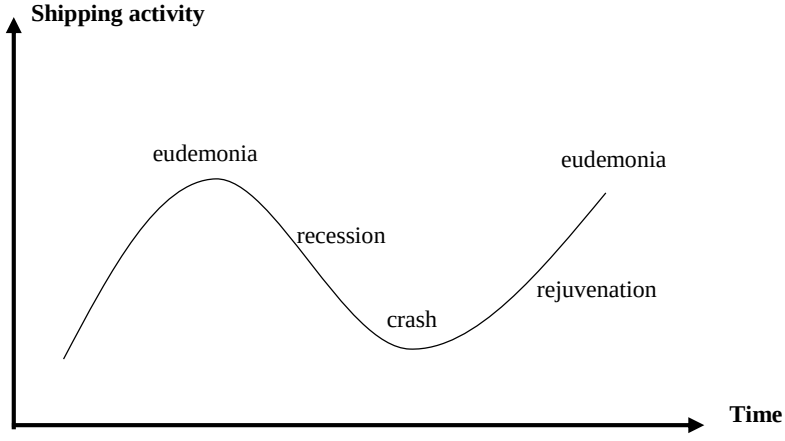


**Figure 3:** The Stage of the Shipping Cycles
Source: Talley, 2012: 213

Eudemonia stage is the peak of shipping activities where freight earnings, secondhand values and newbuilding prices are high. Economic activities are buoyant, demand for shipping services is also high. But high earnings may attract new investors and extra fleet capacity enters to the market. Or demand for shipping activities decreases because of some macroeconomic events. Then earnings start to decrease and this fall continues until an acceptable level for market. This declining period is called as recession, and deep of this fall is called crash stage. In this stage freight levels fall below of the operation costs of the many ships, then they

become uneconomic to operate. If owner's future expected earnings tend to increase, they keep their vessels and wait for opportunities. But if their expected earnings are low, they sell them to the scrapping market. After a while, growth rate of demand passes the growth rate of supply and earnings start to increase again. Current shipowners take advantage of their transport capacity because of leading time in the shipbuilding activities (Beenstock and Vergottis, 1989). Then shipping activities reach the eudemonia stage and these cycles become perpetual activities in the maritime industry. Catching opportunities that are derived from these cycle stages presents more benefit than classical transportation activities.

## 3. LITERATURE REVIEW

There is limited number of study about this topic. Shi et al. (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 et al. (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.

## 4. METHODOLOGY

In this study, correlation analysis will be implemented to determine relationship between variables. Basically two methods are used for correlation calculations. These are Pearson's correlation and Spearman's correlation.

Pearson's correlation coefficient R is a measure of the strength and direction of the linear relationship between two variables. 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).

Pearson correlation coefficient is computed by (1) or a statistical software easily. Scores on the rating scale can be continuous in nature in Pearson correlation which provides a beneficial feature. However, a potential limitation of the Pearson correlation coefficient is that it assumes that the data are normally distributed (Osborne, 2008: 39). Pearson's correlation coefficient is calculated as follows:

$$r_p = \frac{n(\sum XY) - (\sum X)(\sum Y)}{\sqrt{[n(\sum X^2) - (\sum X)^2][n(\sum Y^2) - (\sum Y)^2]}} \quad (1)$$

$$t = \frac{r_p\sqrt{n-2}}{\sqrt{1-r_p^2}} \quad (2)$$

Spearman correlation is calculated based on rank coefficient. It is approximation of the Pearson correlation. But it is also used in circumstances where data investigation is not normally distributed (Osborne, 2008: 39). Correlation coefficient is formed between -1 and 1 as it is Pearson correlation. It is computed as follows:

$$r_s = 1 - 6\left[\frac{\sum d_i^2}{n(n^2-1)}\right] \quad (3)$$

(4)

$$t = \frac{r_s\sqrt{n-2}}{\sqrt{1-r_s^2}}$$

Evaluation of the correlation analysis depends on the degree and direction of the correlation coefficient. General classification of degree of the correlation analysis is presented at Table 1. The closer the absolute value of the correlation coefficient is to 1, the stronger the relationship (Soh, 2016: 40).

**Table 1:** Evaluation of Correlation Coefficients

| Correlation Coefficient | Description |
|---|---|
| 0.90 – 1.00 | Very strong and very high |
| 0.70 – 0.90 | Strong or high |
| 0.40 – 0.70 | Moderate or medium |
| 0.20 – 0.40 | Weak or low |
| 0.00 – 0.20 | Very weak or very low |

Source: Soh, 2016: 40

After correlation coefficients are calculated, t statistics of them are also calculated by (2) and (4). Then t statistics obtained are compared with corresponding table values. If the obtained value is greater than table value, it means that the correlation coefficient is statistically significant. Interpretation of the results starts after this stage.

## 4.1. Hypothesis

The tanker market is divided to four markets that are freight market, sale and purchase market, newbuilding market and demolition market. So research topics are hypothesized into four suppositions. They and their theoretical foundations are explained below. Also their theoretical foundations were emphasized in the theoretical background section.

**$H_1$:** When oil price decrease, time charter earnings of the tankers increase in the short run.

As mentioned above, fleet supply in maritime market is inelastic in the short run because of the lead-time on shipbuilding. So instant increase on demand causes increase on freight levels in the short run. Demand for tanker transportation is supposed to increase instantly because of decreasing trend of oil prices in the examined range.

**$H_2$:** When oil price decrease, secondhand values of the tankers increase in the short run.

There is a strong relationship between freight rates and second hand values of the ships. Ship investors evaluate the current earnings and expected future earnings when they appraise their assets. So, increasing freight rates that is caused by increasing demand for oil will cause increase on second hand values of the taker ships in the short run.

**$H_3$:** When oil price decrease, newbuilding values of the tankers increase in the short run.

High earnings in the sector caused by instant demand for oil attracts new investors into the sector. Also existing players will want to increase their fleet capacity to gain more benefit from the transportation activities. So newbuilding values of tankers will increase in the short run since demand for new ships and second hand values of existing ships increase.

**$H_4$:** When oil price decrease, demolition values of the tankers increase in the short run.

Main customers of the demolition market are old and obsolete ships. They cannot be traded because of high operation costs if the shipowners' expected future earnings are not enough to cover their accumulated losses. When oil price decrease, freight earnings will increase in the short run as mentioned above. Even old and obsolete ships can be operated profitably in buoyant market conditions. So the inefficient ships will be operated and the number of ships that are sent to the demolition market decreases. This situation is supposed to cause an increase on demolition prices because steel recyclers will have to pay more for scrapped steel.

## 4.2. Data

The dataset of the research includes time charter earnings, secondhand values, newbuilding values and demolition prices of different kind of tanker ships. The data and their descriptive statistics are examined in this section.

The Brent Oil Price is selected as representative of oil prices. The dates of the variables are between the range of 02.01.2013 and 08.03.2016. As seen at Table 2, oil price reached weekly average of $118 levels and decreased to $27 weekly average levels. This fall of oil price is expected to cause inevitable effects to tanker markets. The data is not distributed normally according to the Jarque-Bera probability which is smaller than

critical value. This will affect selection of correlation analysis type in the study.

**Table 2:** Descriptive Statistics of Oil Price

| | **OIL** |
|---|---|
| **Observation** | 164 |
| **Mean** | 83.61738 |
| **Median** | 101.0350 |
| **Maximum** | 118.1000 |
| **Minimum** | 27.76000 |
| **Std. Dev.** | 28.81242 |
| **Skewness** | -0.467319 |
| **Kurtosis** | 1.562930 |
| **Jarque-Bera** | 20.08124 |
| **Probability** | 0.000044 |

Source: EIA, 2016

Weekly average of daily 1-year time charter earnings of different types of the tankers are listed below. The data covers the dates between 02.01.2013 and 16.12.2015. As seen below the minimum value of the earnings were $17500 for VLCC and it reached to $55000 levels after decrease in the oil price. All of the data are not distributed normally according to Jarque-Bera statistics.

**Table 3:** Descriptive Statistics of 1 Year Time Charter Rates ($)

| | **VLCC** | **SUEZMAX** | **AFRAMAX** | **PRO_40K** | **PRO_80K** | **LR2** |
|---|---|---|---|---|---|---|
| **Obs.** | 153 | 153 | 153 | 153 | 153 | 153 |
| **Mean** | 30620.92 | 23587.91 | 18439.22 | 15093.14 | 17607.84 | 19580.07 |
| **Med.** | 25500.00 | 20000.00 | 15500.00 | 14500.00 | 15500.00 | 16250.00 |
| **Max.** | 55000.00 | 39000.00 | 29500.00 | 18750.00 | 28500.00 | 29750.00 |
| **Min.** | 17500.00 | 14750.00 | 12250.00 | 13000.00 | 13750.00 | 14500.00 |
| **Std.D.** | 12379.52 | 8219.909 | 5786.924 | 1506.260 | 4060.780 | 5043.940 |
| **Skew.** | 0.584129 | 0.563396 | 0.626941 | 1.192789 | 1.302274 | 0.898294 |
| **Kurt.** | 1.811118 | 1.704510 | 1.897101 | 3.047235 | 3.382711 | 2.229389 |
| **J-B** | 17.71146 | 18.79320 | 17.77738 | 36.29426 | 44.17964 | 24.36252 |
| **Prob.** | 0.000143 | 0.000083 | 0.000138 | 0.000000 | 0.000000 | 0.000005 |

Source: Fearnleys, 2016

Secondhand values of the different types of ships are listed below. The dates of the variables are between the range of 02.01.2013 and 08.03.2016. There are big differences between minimum and maximum values of the ships. For instance, secondhand value of a VLCC tanker was level of $55 million at the start of the dataset and it reached the level of $84 million in three years period that oil price had decreasing trend. The

data of each ship are not distributed normally according to Jarque-Bera statistics.

**Table 4:** Descriptive Statistics of Second Hand Values ($ million)

| | VLCC | SUEZMAX | AFRAMAX | LR1 | MR |
|---|---|---|---|---|---|
| **Obs.** | 166 | 166 | 166 | 166 | 166 |
| **Mean** | 70.60964 | 50.42831 | 37.95000 | 32.39096 | 26.96265 |
| **Med.** | 74.00000 | 50.00000 | 38.00000 | 32.60000 | 26.95000 |
| **Max.** | 84.00000 | 61.00000 | 46.50000 | 39.00000 | 30.50000 |
| **Min.** | 55.00000 | 38.20000 | 27.00000 | 25.00000 | 24.30000 |
| **Std.D.** | 10.62707 | 8.246151 | 6.995104 | 3.796902 | 1.767601 |
| **Skew.** | -0.488212 | -0.140942 | -0.295085 | -0.547389 | 0.275851 |
| **Kurt.** | 1.550544 | 1.447566 | 1.491823 | 2.328788 | 1.734255 |
| **J-B** | 21.12575 | 17.21911 | 18.14172 | 11.40604 | 13.18652 |
| **Prob.** | 0.000026 | 0.000182 | 0.000115 | 0.003336 | 0.001370 |

Source: Intermodal, 2016

Newbuilding values of tankers and their descriptive statistics are listed below. The difference between minimum and maximum values of the newbuilding prices are not much as differences in secondhand values. For instance, minimum newbuilding price of VLCC tanker is $89 million and maximum price of it is $101 million. Also price range of product tankers are lower than others. The all of the values of the data are not distributed normal according to normality test results.

**Table 5:** Descriptive Statistics of Newbuilding Values ($ million)

| | VLCC | SUEZMAX | AFRAMAX | LR1 | MR |
|---|---|---|---|---|---|
| **Obs.** | 164 | 164 | 164 | 164 | 164 |
| **Mean** | 94.63110 | 61.68963 | 51.63354 | 44.13780 | 35.44146 |
| **Med.** | 94.75000 | 64.25000 | 53.00000 | 45.50000 | 35.50000 |
| **Max.** | 101.0000 | 66.00000 | 55.00000 | 47.00000 | 37.30000 |
| **Min.** | 89.00000 | 55.30000 | 46.50000 | 40.00000 | 33.00000 |
| **Std.D.** | 3.654505 | 4.218955 | 2.887997 | 2.503403 | 1.551445 |
| **Skew.** | -0.077908 | -0.670696 | -0.714384 | -0.690788 | -0.499516 |
| **Kurt.** | 1.894127 | 1.612394 | 2.013317 | 1.755162 | 1.656630 |
| **J-B** | 8.522769 | 25.45267 | 20.60197 | 23.63223 | 19.15186 |
| **Prob.** | 0.014103 | 0.000003 | 0.000034 | 0.000007 | 0.000069 |

Source: Intermodal, 2016

The dataset below consists of demolition prices in different demolition regions for tanker ships. The range between minimum and maximum values of the demolition prices are relatively high. For example, demolition prices in China was $125 per ltd at minimum level and $405 per ltd at maximum level. There are wide fluctuations in the prices. The all of the dataset are not normally distributed in respect to Jarque-Bera statistics.

**Table 6:** Descriptive Statistics of Demolition Prices per Ltd ($)

| | TURKEY | PAKISTAN | INDIA | CHINA | BANGLADESH |
|---|---|---|---|---|---|
| **Obs.** | 165 | 165 | 165 | 165 | 165 |
| **Mean** | 278.8788 | 402.6364 | 403.0303 | 275.1818 | 399.0000 |
| **Med.** | 305.0000 | 415.0000 | 415.0000 | 305.0000 | 415.0000 |
| **Max.** | 350.0000 | 490.0000 | 485.0000 | 405.0000 | 485.0000 |
| **Min.** | 160.0000 | 250.0000 | 250.0000 | 125.0000 | 245.0000 |
| **Std.D.** | 57.74300 | 58.80560 | 59.23727 | 84.17623 | 58.44843 |
| **Skew.** | -0.838688 | -0.789882 | -0.811333 | -0.430291 | -0.831446 |
| **Kurt.** | 2.293318 | 2.944689 | 2.860147 | 1.845203 | 3.012823 |
| **J-B** | 22.77679 | 17.17866 | 18.23665 | 14.25984 | 19.01197 |
| **Prob.** | 0.000011 | 0.000186 | 0.000110 | 0.000801 | 0.000074 |

Source: Athenian Shipbrokers, 2016

It is generally seen that, there are big fluctuations in variables except newbuilding prices and all of the data are not normally distributed. As mentioned methodology part, Spearman's correlation is more feasible in non-normal distributions. The next section continues by analyzing the directional relationship between oil price and tanker market indicators.

## 5. RESULTS

Spearman's correlation analysis is implemented to determine directional relationship between tanker market factors. First analysis is developed for $H_1$ which hypothesizes that when oil price decreases, 1-year time charter earnings of tanker ships increase in the short run. According to the results that are listed below, there are negative strong correlations between oil price and earnings. All of the significance levels of the tests are at 99% significance level.

**Table 7:** Correlation Analysis Results of Oil Price and Time Charter Earnings

| | VLCC | SUEZ MAX | AFRA MAX | PRODUCT 80K | PRODUCT 40K | LR2 |
|---|---|---|---|---|---|---|
| OIL | -0.789<br>(-15.8)<br>0.00*** | -0.824<br>(-17.8)<br>0.00*** | -0.810<br>(-16.9)<br>0.00*** | -0.826<br>(-18.01)<br>0.00*** | -0.641<br>(-10.2)<br>0.00*** | -0.902<br>(-25.7)<br>0.00*** |

Significance levels: *** 99%, ** 95%, * 90%, t statistics in parenthesis ()

Second analysis is implemented for $H_2$ which asserts that when oil price decreases, secondhand values of the tankers increase in the short run. Results show that except value of MR tanker type, values of all tankers have negative strong correlation with oil price and they are significant at 99% level.

**Table 8:** Correlation Analysis Results of Oil Price and Second Hand Values of Tanker Ships

| | VLCC | SUEZMAX | AFRAMAX | LR1 | MR |
|---|---|---|---|---|---|
| OIL | -0.751<br>(-14.5)<br>0.00*** | -0.835<br>(-19.5)<br>0.00*** | -0.828<br>(-18.9)<br>0.00*** | -0.770<br>(-15.4)<br>0.00*** | -0.079<br>(-1.0)<br>0.30 |

Significance levels: *** 99%, ** 95%, * 90%, t statistics in parenthesis ()

Third analysis of the study is related to newbuilding prices of tanker values and tests $H_3$ which supposes when oil price decreases newbuilding prices of the tankers increases in the short run. According to the results, value of Suezmax and LR1 tanker ships have negative weak correlation with oil price. Bu their t statistics are high and they are significant at 99% level. MR and Aframax tanker ships have very weak negative correlation with oil price. They are significant at 95% and 90% levels respectively. The coefficient of VLCC tanker value is very weak and insignificant.

**Table 9:** Correlation Analysis Results of Oil Price and Newbuilding Values of Tanker Ships

| | VLCC | SUEZMAX | AFRAMAX | LR1 | MR |
|---|---|---|---|---|---|
| OIL | -0.109<br>(-1.40)<br>0.16 | -0.250<br>(-3.29)<br>0.00*** | -0.139<br>(-1.78)<br>0.07* | -0.340<br>(-4.61)<br>0.00*** | -0.154<br>(-1.99)<br>0.04** |

Significance levels: *** 99%, ** 95%, * 90%, t statistics in parenthesis ()

The last analysis of the study is related to demolition prices. $H_4$ asserts that when oil prices decrease, demolition prices increase. The results at Table 10 show that all of the correlations are positive direction. Demolition prices in Turkey, Pakistan, India and Bangladesh have moderate degree of positive correlation while price in China has strong positive correlation. Also all of the correlations are significant at 99% level.

**Table 10:** Correlation Analysis Results of Oil and Demolition Prices of Tanker Ships in Different Regions

| | TURKEY | PAKISTAN | INDIA | CHINA | BANGLADESH |
|---|---|---|---|---|---|
| OIL | 0.691<br>(12.22)<br>0.00*** | 0.529<br>(7.97)<br>0.00*** | 0.561<br>(8.66)<br>0.00*** | 0.888<br>(24.71)<br>0.00*** | 0.545<br>(8.31)<br>0.00*** |

Significance levels: *** 99%, ** 95%, * 90%, t statistics in parenthesis ()

The visual relationship among all variables that touched upon in this section also can be seen at Appendices.

## 6. CONCLUSION AND DISCUSSION

Possible effects of the oil price on the tanker market in the short run hypothesized into four sub hypothesis which represent the four shipping markets. Effect of decrease in oil price to the freight market is assumed to be in the positive direction based on the theoretical background. The sudden increase in demand for oil prices would cause an increase in freight rates in the short term. Secondhand and newbuilding values of the tankers would also increase depending upon increase in freight earnings. And lastly, demolition prices would move inverse direction at the price of oil according to theory and hypothesis.

Time charter earnings in the tanker market reflected significant very strong negative correlation with oil price as mentioned in the theory. Inelasticity of the supply curve caused a brief cyclical burst in freight. The time charter earnings were about $19000 and it reached about $55000 after falling oil prices trend.

Secondhand ships become cash cows in buoyant market conditions, so their values move together with freight rates according to the theory. The results showed that, secondhand market was affected by oil prices as much as freight market. Correlation coefficients were negatively significant and strong.

The reflection of newbuilding prices in the tanker market to change in oil price was not at the expected level. Correlation coefficients were negatively significant but very low. This may arise from learning from the past, recently occurred economic crisis may have caused them not to be hasty in their investment decisions. Or since the shipyards have sufficient facilities to meet orders, the demand point at the shipbuilding market may have remained elastic points at the curve. Thus price volatility in the newbuilding market remained relatively stable.

Except demolition market, the other markets moved in parallel with theoretical base. The study expected to investigate a negative correlation between demolition prices and oil prices. But results showed that there was a positive significant moderate correlation. According to the theory, it was hoped that the demolition prices would increase due to the decrease in ship numbers sent to scrapping by the effect of increasing income. The other factors such as demand for steel, steel prices and amount of other types of ships sent to the demolition may result this situation.

This study contributes existing theory by analyzing short run effects of a commodity price to its transport activities. Extraordinary fall of oil price facilitates the analysis. It is seen that newbuilding and demolition markets may be affected less than other markets or opposite of the theory in the short run.

This study contributes to practice by analyzing recent cycle in the tanker market. For instance, the difference between minimum and maximum values of a secondhand VLCC tanker is $29 million, and the difference between time charter earnings is $37500 at the examined 3 years period. So timing on commercial decision making and investing an asset in the shipping market is essential for shipowners.

## 7. LIMITATIONS OF THE STUDY AND SUGGESTIONS

The study has some limitations as well. The dataset consists of time series data. So before regression analysis, they could be tested for unit roots to obtain better results. But the dataset consists of maritime indicators and they do not change continuously in the short run. Due to this slow change, it is difficult to find positive results after clearing the unit roots. Also the dataset is collected from free publications one by one as weekly averaged values.

Further researches may model these relationships by different and complicated econometric models with more workable datasets. Also supply is assumed to be constant in this study, because the study examines the relationship in the short run. Time for new entrance to the market needs to be 2 or 3 years because of lead time on shipbuilding. Next studies my cover long run relationship adding changing supply into the model. Another suggestion for further research is adding voyage costs to the model, because decrease of oil price causes a decrease on voyage costs of the tankers. Bunker cost forms majority of the voyage cost. This study does not take bunker costs into consideration.

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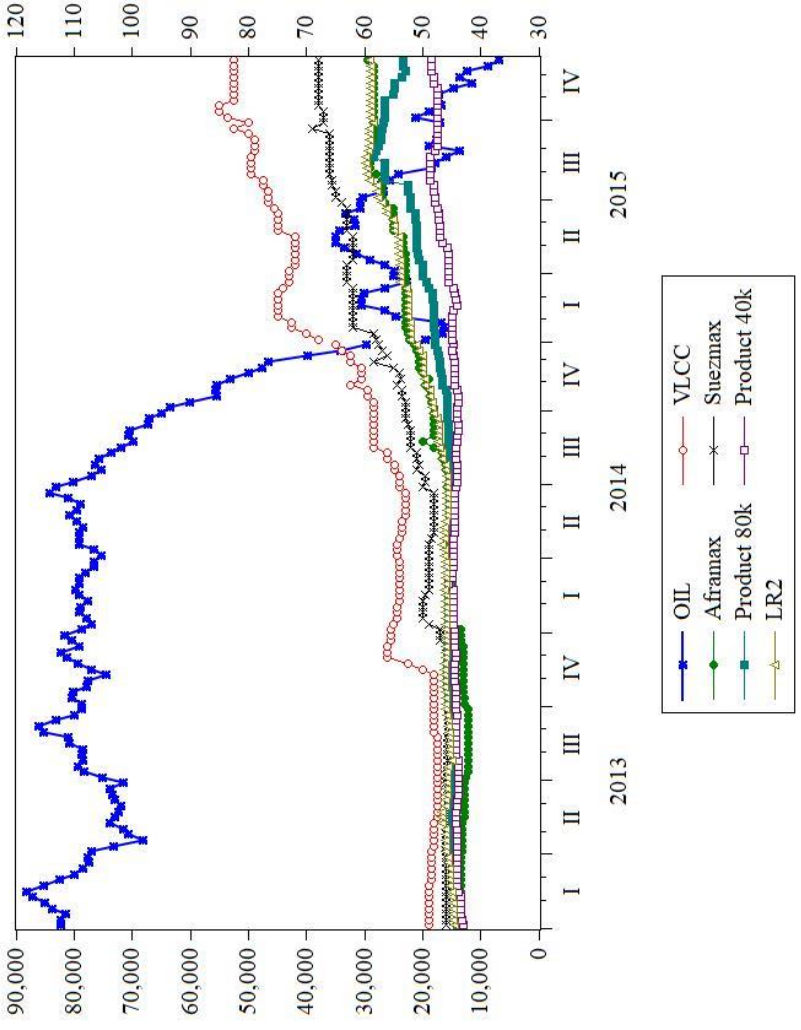
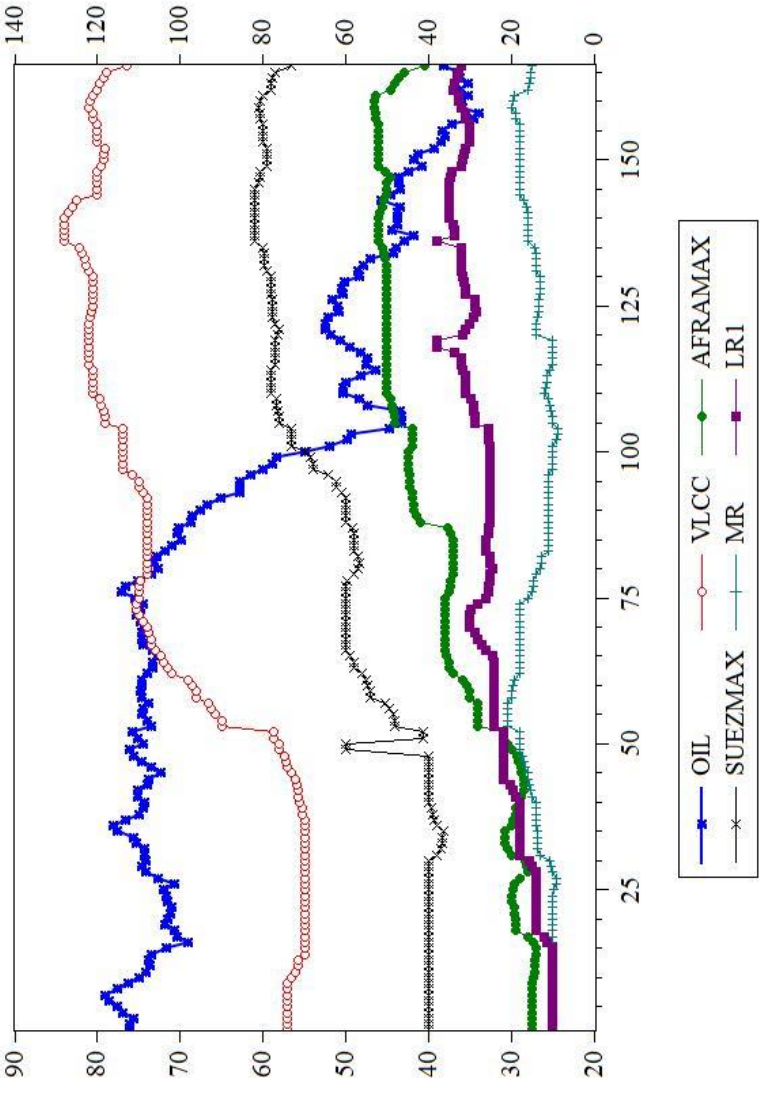
**APPENDICES**

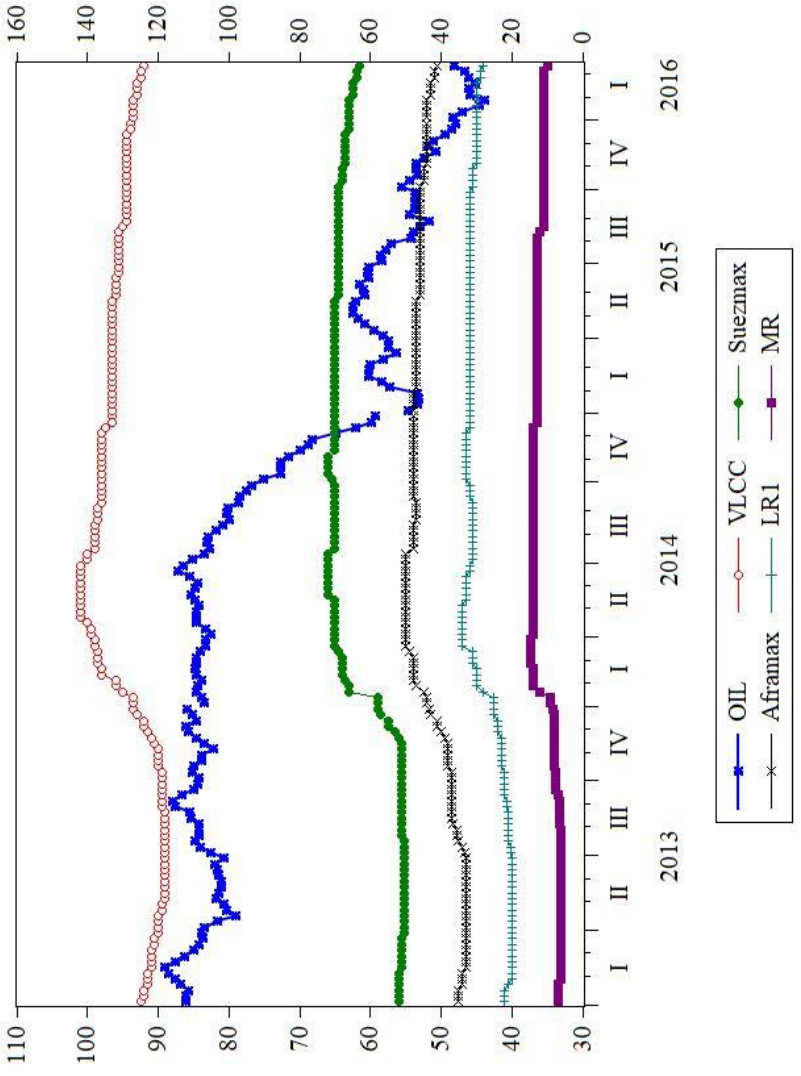
APPENDIX 1- TIME CHARTER EARNINGS AND OIL PRICE ($)



APPENDIX 2 – SECONDHAND TANKER VALUES ($M) AND OIL PRICE ($)



APPENDIX 3 – NEWBUILDING TANKER PRICES ($M) AND OIL PRICE ($)



APPENDIX 4 – DEMOLITION AND OIL PRICES ($)