Analysis of the Interrelationships between the Various Shipping Markets.

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ABSTRACT

This research paper was conducted to critically examine the shipping market research and the various roles played by the tankers shipping industry segment. It also provides empirical evidence to illustrate the linkages between seaborne trade and the different market segments in tanker shipping industry. Secondly it provided an overview of the linkage among different segments in the shipping market for researchers and practitioners to better understand the shipping industry. Secondary data from Suazmax Tankers, between 1987 and 2010, were extracted from the Clarkson Research Studies. The data were analysed using the Spearman Rank Correlation Coefficient and the following were gathered; that there is a positive relationship between seaborne trade and freight rate, Seaborne trade has positive association with fleet size and also that Seaborne trade has positive association with fleet size.

Keywords: Market, Ship Building, Freight, Demolition, Sale And Purchase.

INTRODUCTION

There are four inter-linked market in the tanker shipping industry. Sea transport services are dealt in the freight market, new ships are ordered and built in the new building market, used ships are traded in the sale and purchase market, and old or obsolete ships are scrapped in the demolition market. Correlation analysis is conducted to illustrate the linkage among these four interrelated shipping markets.

The study variables involved are:

a) Freight rate, i.e., the value that carriers are willing to accept and shippers are willing to pay for sea transport services,

b) New building vessel price, i.e., the value that ship builders are willing to accept and shipowners are willing to pay to buy new ships

c) Second-hand vessel price, i.e., the value that ship owners are willing to pay and accept to trade used ships in the sales and purchase market, and

d) Scrapping vessel price, i.e., the value that scrappers are willing to pay and ship owners are willing to accept to scrap old ships.

AIM OF THE STUDY

The general aim of this work is to develop a paper on shipping market research.

Specifically, the aim of this research work is to;

- Provide empirical evidence to illustrate the linkages between seaborne trade, fleet size and the different market segments in tanker shipping industry.
- Secondly to provide an overview of the linkage among different segments in the shipping market and shipping market types for researchers and practitioners to better understand the shipping industry.

HYPOTHESIS

Three hypotheses were raised in null and alternative forms which include;

Null Hypotheses

H_{01}:   Freight rate has no positive association with seaborne trade

H_{02}:   Freight rate has no positive association with fleet size

H_{03}:   Seaborne trade has no positive association with fleet size

Alternative Hypotheses

H_{A1}:   Freight rate has positive association with seaborne trade

H_{A2}:   Freight rate has positive association with fleet size

H_{A3}:   Seaborne trade has positive association with fleet size

TYPES OF SHIPPING MARKET

According to Martin S. (2009), the shipping market is the whole that determines the sale and purchase of ships. How the ships are chartered and the way the prices of this is established. The actors moving this market are

shipowners, shipbuilders, charterers and shipping companies. This market is formed by four markets that interact to form and are each part of the overlapping market:

1. The freight market,
2. The sale and purchase market,
3. The new building market,
4. The demolition market.

These four markets are linked by cash flow and push the market traders in the direction they want.

- **The freight market (*Chartering/(shipping)***

The freight market consists of shipowners, charterers and brokers. They use four types of contractual arrangements: the voyage charter, the contract of affreightment, the time charter and the bareboat charter. Shipowners contract to carry cargo for an agreed price per tonne while the charter market hires out ships for a certain period. A charter is legally agreed upon in a charter-party in which the terms of the deal are clearly set out.

- **The new build market**

The significant difference with the sale and purchase market is that the ships that are sold here don't exist yet. Anticipation of the market is crucial for those contracting the construction of a ship. Payment is usually done in five parts. Ten percent upon signing the contract. The rest in even parts during different phases of construction; cutting of the steel; laying of the keel; launching; delivery. Prices are determined, as always, by price and demand. Also resources must be taken into account.

- **The sale and purchase market**

The actors are again the same as in previously mentioned markets. Despite the reason of sale, this is typically done free of any financial obligations tied to the ship and with instant delivery. Shipbrokers usually act as a middle man in these sales, but the internet replaces more and more of them. The price of the ship depends on many factors. The most important is the momentary demand for transport which that type of ship could deliver. Despite any debt that a selling owner may have, or the interest that a third party may have, in a ship being sold, the crew always has first lien to the value of the ship if they are still to be paid.

- **The new building market**

The new building market deals with transactions between shipowners and shipbuilders. Contract negotiation can be very complex and extend beyond price. They also cover ship specifications, delivery date, stage payments and finance. The prices on the new building market are very volatile and sometimes follow the prices on the sale and purchase market.

- **The demolition market**

After a ship's lifespan is exceeded it will be demolished. It's steel and components will be dismantled and sold. Since this work is hard, dangerous and badly paid it is done in the Far East. Ships are sold for scrap. The transactions happen between shipowners and demolition merchants, often with speculators acting as intermediaries.

THE SHIPPING MARKET'S SEGMENTATION

According to Evans M (1997), main objective of segmentation is to help the company focus its efforts to the most promising opportunities. The segmentation of the shipping market is a behavioral one, since it is based on the buying behaviour of the charterers – shippers. The market segments are based on the charterers – shippers' needs for sea transport of cargo with a specific type of vessel to a specific geographical region and with specific chartering terms.

The shipping market is constituted by separate segments differentiated as to

- The type of cargo,
- The type of ship,
- The trade routes,
- The type and duration of charter.

In every segment the buying behavior of the charterers – shippers presents common characteristics. The segmentation criteria are the following:

According to the type of ships, the shipping market may be divided into the
   a) Dry Bulk Carrier market,
   b) Tanker market,
   c)   LNG/LPG market,
   d) Combined Carrier market,
   e) Containership market,
   f) RO/RO market
   g) Reefer Market.

According to the type of cargo, the shipping market may be broadly divided into the
   a) Dry Bulk Cargo,
   b) Liquid Bulk Cargo,
   c) Specialised Cargo
   d) General Cargo Market.

According to the type of trade routes, the shipping market may be divided into many segments such as
   a) The market of Mediterranean Sea
   b)   The market of Caribbean Sea e.t.c..

According to the duration of the charter, the shipping market is divided into
   a) The spot market
   b) The time-charter market.

According to the type of charter the market is divided into
   a) The Voyage Charter Market,
   b)   The Time Charter Market,
   c) The Bareboat Charter Market
   d) The Contract of Affreightment Market.

Research in Shipping & Freight Market can be carried out in areas such as;

   • Offshore shipping
   • Shipping investment & finance
   • Dry/bulk shipping
   • Container shipping
   • Coastal shipping
   • Ro-Ro vessels
   • CFS market information
   • Tanker shipping market analysis
   • Logistic market analysis
   • Market segmentation
   • Estimating market size
   • Risk analysis
   • Ship valuation
   • Shipping disinvestment
   • Shipping market entry strategy
   • Shipping investment analysis
   • Joint venture & positioning

The difference kinds of services in the shipping industry are
   a) Liner shipping service
   b) Tramp service

Liner Service –This is a service that operates within a schedule and has a fixed port rotation with published dates of calls at the advertised ports.. A liner service generally fulfills the schedule unless in cases where a call at one of the ports has been unduly delayed due to natural or man-mad causes..

Example : The UK/NWC continent service of MSC which has a fixed weekly schedule calling the South African ports of Durban, Cape Town and Port Elizabeth and carrying cargo to the UK/NWC ports of Felixstowe, Antwerp, Hamburg, Le Havre and Rotterdam..

A **Tramp Service** or tramper: This type of service on the other hand is a ship that has no fixed routing or itinerary or schedule and is available at short notice (or fixture) to load any cargo from any port to any port.

Example : A ship that arrives at Durban from Korea to discharge cargo might carry some other cargo from Durban to the Oakland in the West Coast of USA which in an entirely different direction.. From Oakland say for example it could carry some cargo and go to Bremerhaven.

FOR THE PURPOSE OF THIS RESEARCH WORK, THE OIL TANKER WOULD BE USED AS A CASE STUDY.

Oil tanker is designed for the bulk transport of oil. Basic types of tankers include crude tanker and product tanker. Crude tanker transports unrefined crude oil from extraction locations to refineries while product tanker ships refined products to points close to consuming markets. Tankers are generally categorized by size, e.g., Panamax, Aframax, Suezmax, VLCC, and ULCC. Tanker shipping provides an economical and convenient way to transport liquid bulk for international seaborne trade. Many maritime economists believe that the supply of tanker shipping operates under perfect competition is characterized by several conditions. The first feature is number of shipping service providers. There are a number of ship owners that own tankers that provide identical shipping services. The second characteristic is the availability of information. In the tanker market, information on freight rate can be searched via such means as the Baltic Index. Hence, shipping service providers are unable to manipulate the price. Obstacles to entry to and exit from the industry exist but these challenges can be managed. Entry barriers, such as government regulations, economic factors, and marketing condition, are not present in the tank shipping industry. On the one hand, huge capital investment is needed to acquire ships (new ships from the new building market or second-hand ships from the sales and purchase market) to enter the industry. On the other hand, shipping firms may withdraw from the market by selling their assets (i.e., ships) in the second-hand vessel sale and purchase market Y. H. V. Lun et al., (2010).

In 2010, the tanker trade volume reached to 2,767 million tons due to growth in demand for energy commodities. The increased cargo volume in the tanker market leads shipping firms to adjust their supply by building new ships in the new building market, and acquiring second-hand vessels in the sale and purchase market. In tanker shipping, price level (i.e., freight rate) is influenced by the market (i.e., demand for shipping service and supply of shipping service). In the context of research in tanker shipping, the demand for shipping is seaborne trade in energy products because demand for tanker shipping occurs as a result of demand for seaborne tanker shipping service (i.e., derived demand). On the other hand, the supply of shipping service is fleet size in the tanker shipping market. From the perspective of the industrial organization paradigm, the interaction between the demand for and the supply of tanker shipping service affects the market structure, which in turn plays a significant role in determining the investment and operation decisions in the marketplace (Tirole 2003).

The tanker shipping market brings shippers and carriers together to determine the supply of shipping capacity (i.e., fleet size) and demand for shipping services. Hence, demand for shipping service plays a significant role in the shipping industry. Although oil prices have experienced a sharp increase, there is a significant growth in the demand. The volume of seaborne trade has doubled over the past two decades. The increase in quantity demand for shipping services due to growth in seaborne trade volume leads to rise in freight rate. Freight rate motivates shipping firms to adjust their fleet sizes by placing orders for new vessels or scrapping their serving vessels. It also affects vessel prices.

The topic of tanker shipping is important to explore from the perspectives of both academic researchers (Glen and Martin 2002; Lyridis et al. 2004; Alizadeh and Nomikos 2006; Goulielmos and Psifia 2007) and industrial practitioners (Ocean Shipping Consultants Ltd 2004; UNCTAD 2009; Clarkson Research Studies 2010). Studies dedicated to developing an empirical model to forecast fleet size is desirable to facilitate industrial practitioners to make key decisions such as capacity management and investment strategy. This research aims to provide empirical evidence to illustrate the linkages between the different market segments in tanker shipping industry. Another aim of this research work is to provide an overview of the linkage among different segments in the shipping market for researchers and practitioners to better understand the shipping industry.

Tanker Shipping

The tanker shipping industry comprises four different but closely associated markets. Sea transport services are dealt in the freight market, new ships are ordered and built in the new building market, used ships are traded in the sale and purchase market, and old or obsolete ships are scrapped in the demolition market.

Prices of these four shipping markets are determined by the interactions of buyers and sellers of the markets (Dikos and Marcus 2003). These four shipping markets can be categorized into real market and auxiliary markets (Strandenes 2002; Adland et al. 2006a, b; Lun and Quaddus 2009). Shipping firms order new ships in the new building market and scrap unused ships in the demolition market. New building and scrapping markets are real market as their activities affect the overall shipping activities. On the other hand, shipping firms provide sea transport services to shippers in the freight markets and shipper owners trade their used ships in the sale and purchase market. The auxiliary market consists of the freight market trades sea transport services and the sale and purchase market trades second-hand vessels. These two markets are categorized as auxiliary market as their transactions do not change existing shipping capacity. Shipping firms provide sea transport services to shippers in the freight markets and shipper owners trade their used ships in the sale and purchase market.

THE TANKER SHIPPING MARKET

Trades sea transport services and the sale and purchase market trades second-hand vessels. These two markets are categorized as auxiliary market as their transactions do not change existing shipping capacity. Shipping firms provide sea transport services to shippers in the freight markets and shipper owners trade their used ships in the sale and purchase market.

SEABORNE TRADE

Shipping firms provide global shipping services transporting cargoes to meet the demand for sea transport services (Kendall and Buckley 2001). Generally speaking, carriage of goods does not take place unless there is a need for cargoes to be delivered from production to consumption areas. Demand for tanker shipping services is derived from the trade between buyers and sellers in the energy trade market. As demand for tanker shipping service is a derived demand, seaborne trade is a crucial variable in tanker shipping market. Previous studies (e.g., Metaxas 1971; Lun and Quaddus 2009; Stopford 2009) have suggested the positive association between seaborne trade and freight rate. Change in freight rate is influenced by seaborne trade volume (Lun et al. 2010). In the tanker shipping market, freight rate is an important indicator for shipping firms to conduct their business. When the volume of seaborne trade goes up, demand for sea transport services will rise. The excessive demand for shipping services will lead to the upward trend of freight rate. Freight rate also affects the decision of tanker shipping firms to adjust their fleet size and hence increase their supply in the tanker market. High freight rate stimulates growth in world fleet.

Tanker shipping can be seen as a capital intensive industry as huge investment in ships is required (Chen and Wang 2004). The return on investment in ships relies on seaborne trade volume (Stopford 2009). Cargoes cannot be delivered to destination without adequate investment in shipping capacity. If ships are invested but demand for shipping services is insufficient, lay up of ship is costly. The need for sea transport is derived from seaborne trade and shipping firms are not able to control the change of demand for shipping service (McConville 1999). To tackle with an increase in sea cargo volume, tanker operators tend to enlarge the capacity of sea transport. Hence, seaborne trade influences the key decision in shipping industry with regard to adjustment of shipping capacity.

FREIGHT RATE IN THE TANKER SHIPPING MARKET

The freight market is a place where buyers and sellers are brought together to trade sea transport services. The demand for and supply of tanker shipping services interact with each other to determine freight rate. Due to the nature of derived demand, demand for sea tanker shipping services depends on the seaborne trade volume (Lun and Quaddus 2009). On the other hand, supply of shipping service is inelastic in the short run. Excessive supply of shipping capacity not only causes reduction in freight rate but also extra operational cost to lay up ships. On the other hand, shortage in ships leads to an increase in freight rate to motivate shipping firms for adjusting their shipping capacity. Although trade volume grows in the
past decades, shipping firms may make their investment decision only when they expect that future freight rate will increase. However, it may take a few years for shipping firms to take delivery of new ships if they decide to increase their shipping capacity.

TRADE VOLUME AND FLEET SIZE

Tanker shipping service provided by shipping firms aims to meet the demand for sea transport services. Carriage of goods takes place only when there is a demand for transport. Tanker shipping services derived demand from the seaborne energy trade. When there is an increase in the demand for tanker shipping service, freight rate will

go up. High freight rate attracts ship owners to provide more shipping capacity to increase the supply of shipping services. Hence, seaborne trade is a crucial variable in tanker shipping market.

1. New Building Vessel in the Tanker Shipping Market

The new building market and the freight market are positively associated. Shipping firms order new ships to expand their fleet sizes during freight boom. In the tanker shipping industry, demand for new vessels reflects the need for shipping capacity. 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.

From the perspective of business operations, prices of new building ships have a stabilizing effect in the tanker shipping (Dikos 2004). When the demand for shipping services increase, shipping firms make the decision to increase their shipping capacity by ordering new ships. At the same time, freight rate increases due to the high demand for shipping services. High freight rate indicates that shipping firms can earn higher than normal profit. When the demand for seaborne rises, high freight rate and profit level affect shipping firms to place orders for new ships. With the increase in demand for new ships, prices in the shipping building market also increase. Hence, capital cost of shipping firms increases. Such rise in the prices of new ships could be seen as a ''stabilizer'' to set a ''barrier'' for shipping firms for excessive profit.

2. Second-Hand Vessel in the Tanker Shipping Market

In the shipping market, the freight market is the main source of cash for the tanker shipping operations. The revenue earned in the freight market provides financial support to tanker shipping firms for acquiring new ships and second-hand vessels to serve the demand for shipping services. Beenstock (1985) proposed that the new building and second-hand vessels are substitutes to each other as they are same kind of assets. New building ships and used ships are positively associated as both of them can be deployed to carry cargoes. While the deployment of new building

3. The Tanker Shipping Market

Ships may require waiting for a few years after placing the new order, the lead time to deploy second-hand ships to freight market are much shorter. At the time of freight booms, the second-hand vessel market is a good option for shipping firms to adjust their shipping capacity to satisfy the demand for tanker shipping services (Goulielmos 2009).
The second-hand vessel market can be categorized as an auxiliary market and the buying and selling of used ships are unlikely to alter the existing number of ships and the carrying capability in the tanker shipping market (Strandenes 2002).

The sales and purchase market facilitates the entry of shipping firms to the shipping market as shipping firms may acquire ships in the sales and purchase market with lower capital requirements. Another key function of the second-hand vessel market is the allocation of ships among ship operators. With the sales and purchase of used ships, the ship owners are able to exit the market or restructure their existing fleets in response to the changing demand (Strandenes 2002). As the demand for second-hand ships increase during the freight booms, the second-hand vessel market is also closely linked with the freight market. At the time of high freight rate, demand for second-hand ships are high as shipping firms can deploy these ships to earn higher than normal profit. Hence, the price of second-hand ships increases during the time of freight boom and decreases during the time of freightdepression (Lun and Quaddus 2009). On the other hand, low vessel prices usually correspond with low freight rates.

4. Scrapping Vessel in the Tanker Shipping Market

Ships are bought and sold in different tanker markets. The new building market deals with new vessels while old or obsolete vessels are scrapped in demolition market. Activities of these two markets determine tanker shipping capacity to serve the seaborne trade (Strandenes 2002). 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. Knapp et al. (2008) suggested that an increase in scrap price leads to a higher chance of vessels being scrapped. In the last decade, 2006, the worldwide consumption of steel grew significantly. The increase in demand for steel induces higher price of steel and subsequently boost scrapping price of demolished vessels (Knapp et al. 2008). On the other hand, the activity in scrapping market is associated with the second-hand market. At the time for freight boom, ship owners may keep

the used ships to carry cargoes or sell these ships to other ship owners. On the contrary, ship owners are willing to send their ships to demolition market when they expect the profitability for vessels are negative in the foreseeable future and the demand for second-hand ships in the sale and purchase market is weak.

RESEARCH DESIGN

To study the tanker market, the data from Suazmax Tankers, between 1987 and 2010, were extracted from the Clarkson Research Studies. (Source: www.clarksons.com). This published data provides relevant objective data to measure the study variables comprising seaborne trade, freight rate, fleet size, new building vessel price, second-hand vessel price, and scrapping vessel price in the tanker shipping industry.

**Descriptions of the data are shown in the Table below;**

Year	Seaborne trade (Million ton)	Freight rate	Fleet size	New building vessel priced million USD	Second-hand vessel price million USD	Scrapping vessel price million USD
1987	1343.00	54.33	31.90	36.00	25.00	4.92
1988	1488.00	62.37	32.11	45.00	35.0	6.24
1989	1661.00	82.04	32.62	54.00	42.00	5.76
1990	1587.00	87.88	34.34	66.00	39.00	4.56
1991	1551.00	89.73	35.33	68.00	40.00	4.08
1992	1641.00	59.95	37.29	62.50	32.50	3.36
1993	1783.00	72.98	40.13	62.00	33.00	3.72
1994	1802.00	73.27	40.49	51.00	34.00	4.32
1995	1844.00	82.47	40.08	54.00	38.00	4.80
1996	1942.00	92.69	39.63	51.00	42.50	4.08
1997	2041.00	96.83	38.89	52.00	44.00	3.94
1998	2070.00	85.28	40.42	44.00	36.50	2.90
1999	2108.00	75.91	41.70	42.50	35.00	3.46
2000	2180.00	160.96	40.79	52.50	49.00	4.39
2001	2237.00	110.53	41.51	46.50	39.00	3.22
2002	2223.00	80.50	39.39	43.75	38.00	4.32
2003	2356.00	135.00	41.30	51.50	47.00	6.60
2004	2486.00	196.99	42.71	71.00	75.00	9.36
2005	2576.00	159.52	44.62	71.00	75.00	7.92
2006	2686.00	151.68	48.21	80.50	82.00	9.84
2007	2764.00	118.75	51.83	90.00	92.00	12.60
2008	2760.00	180.34	54.08	91.00	78.00	6.84
2009	2659.00	65.53	54.82	62.50	56.50	8.16
2010	2767.00	98.78	59.50	66.75	59.00	11.88

World scale rate is a weighted average of spot prices from different routes

Fleet size in million deadweight tons

Second-hand five-year vessel price in million USD

Note that: 2010 is an estimated figure
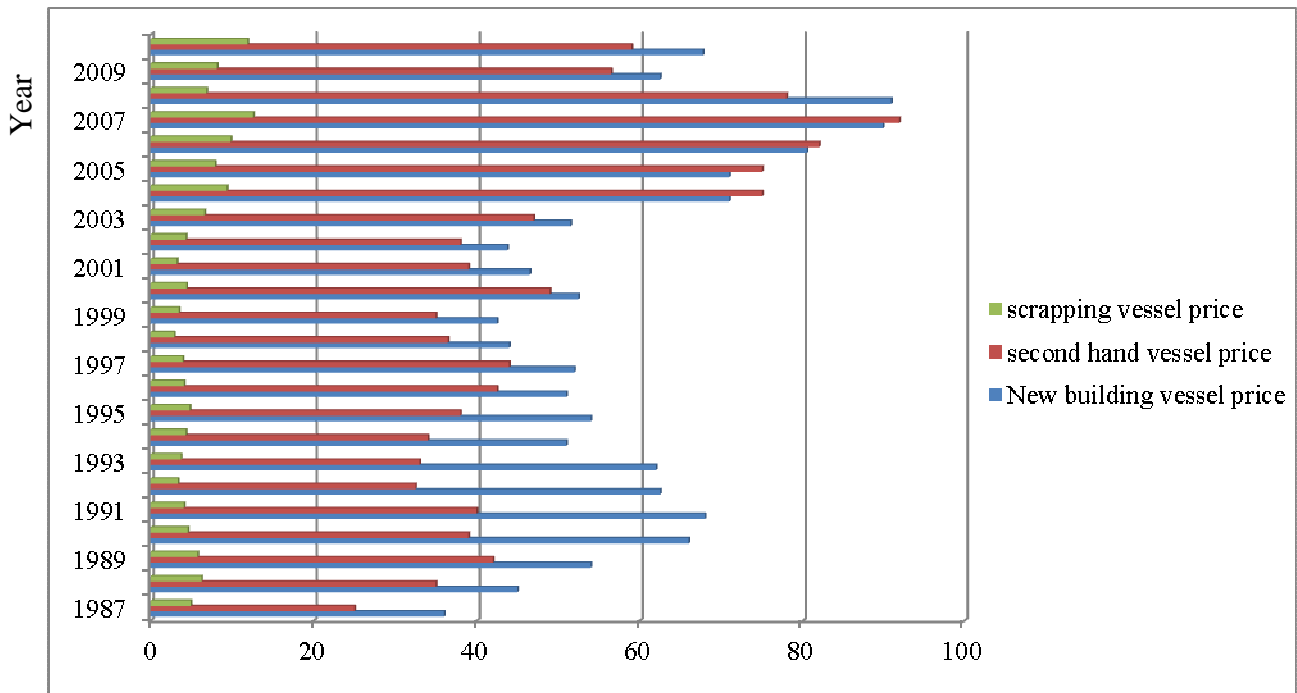
Fleet Market Price (in million USD)

Figure 1

The above table 1 is represented using a bar chat below;
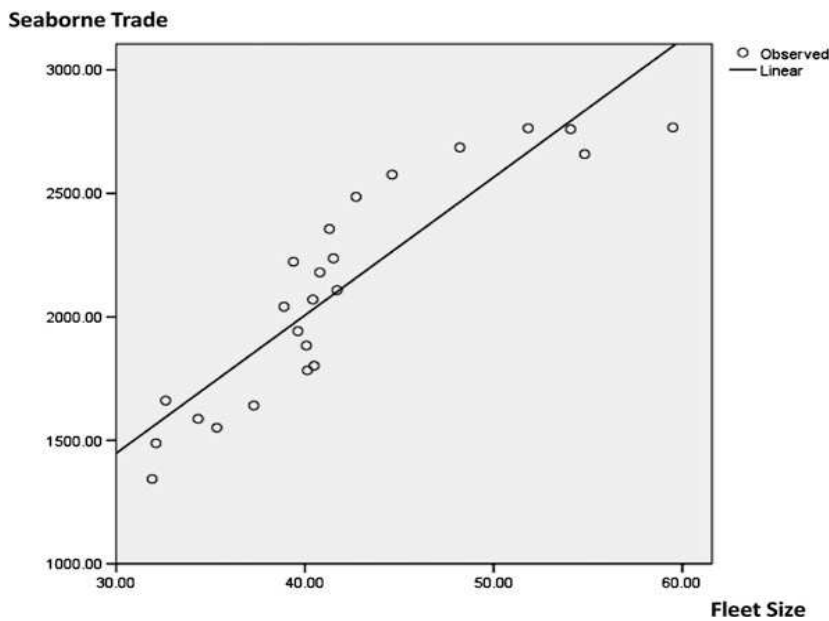
Relationship between seaborne trade and fleet size
Figure 2

ANALYSIS OF DATA

The data were analysed using the spearman Rank Correlation Coefficient.

To measure the degree of association between seaborne trade (in million ton) and the freight rate, the spearman

Rank Correlation Coefficient was therefore used. The equation is shown below;

$$\gamma_s = 1 - \frac{6 \sum_{n}^{n} d_i^2}{n(n^2 - 1)}$$

Where d is the difference between the assigned ranks to x_i and the ranks assigned to y_i where I = n1, 2 ….., n the sample size. The value γ_s is also lies between -1 and +1 and provides an estimate of the population rank correlation Ps

Analysis of Hypothesis 1

H_{01}:   Seaborne trade has no positive association with freight rate

H_{AI}:   Seaborne trade has positive association with freight rate

	Seaborne Trade (Million ton)	Freight rate Million DWT	$R(y_i)$	$R(x_i)$	di	di^2
1987	1343.00	54.33	1	1	0	1
1988	1488.00	62.37	2	3	1	1
1989	1661.00	82.04	5	9	4	16
1990	1587.00	87.88	4	12	8	64
1991	1551.00	89.73	3	13	10	100
1992	1641.00	59.95	6	2	-4	16
1993	1783.00	72.98	7	5	-2	4
1994	1802.00	73.27	8	6	-2	4
1995	1844.00	82.47	9	10	1	1
1996	1942.00	92.69	10	14	4	16
1997	2041.00	96.83	11	15	4	16
1998	2070.00	85.28	12	11	-1	1
1999	2108.00	75.91	13	7	-6	36
2000	2180.00	160.96	14	22	8	64
2001	2237.00	110.53	16	17	1	1
2002	2223.00	80.50	15	8	-7	49
2003	2356.00	135.00	17	19	2	4
2004	2486.00	196.99	18	24	6	36
2005	2576.00	159.52	19	21	2	4
2006	2686.00	151.68	21	20	-1	1
2007	2764.00	118.75	23	18	-5	25
2008	2760.00	180.34	22	23	1	1
2009	2659.00	65.53	20	4	-16	256
2010	2767.00	98.78	24	16	-8	64
TOTAL						**781**

Where $R(y_i)$ = ranking of seaborne trade

$R(x_i)$ = ranking of freight rate

d_i = the difference ranking of seaborne trade and freight rate.

d_1^2 = square of the d_i

Using the formula

$$\gamma_s = 1 - \frac{6 \sum\limits^{n} d_i^2}{n(n^2 - 1)}$$

$$\gamma_s = 1 - \frac{6(780)}{N24(24^2 - 1)}$$

$$= 0.6608$$

This shows a strong positive correlation (association) between seaborne trade and freight rate.

To examine the strength of this positive correlation using; $t = r_s \sqrt{\dfrac{n-2}{1-r_s^2}}$

$$= 0.6608\sqrt{24-2/1-(0.6608)^2} = 4.133$$

Degree of freedom= n-2= 24-2 = 22

The critical value of t for α =0.05 and 22 degree of freedom = 1.7171

Thus the t_c = 4.133, $t_{0.05}$ (22) =1.7171

Therefore we rejects H_0 and concludes that there is an association between seaborne trade and freight rate is 0.6608. or that freight rate is positively associated with seaborne trade.

Analysis of Hypothesis 2
H_{01}:   freight rate has no positive association with fleet size
H_{AI}:   Freight rate has positive association with fleet size

Year	Seaborne Trade (Million ton)	Fleet size	Freight rate Million DWT	$R(a_i)$	$R(x_i)$	di	di^2
1987	1343.00	31.90	54.33	1	1	0	0
1988	1488.00	32.11	62.37	2	3	1	1
1989	1661.00	32.62	82.04	3	9	6	36
1990	1587.00	34.34	87.88	4	12	8	64
1991	1551.00	35.33	89.73	5	13	7	49
1992	1641.00	37.29	59.95	6	2	-4	16
1993	1783.00	40.13	72.98	11	5	-6	36
1994	1802.00	40.19	73.27	12	6	-6	36
1995	1844.00	40.08	82.47	10	10	0	0
1996	1942.00	39.63	92.69	9	14	5	225
1997	2041.00	38.89	96.83	7	15	8	64
1998	2070.00	40.42	85.28	13	11	-2	4
1999	2108.00	41.70	75.91	17	7	-10	100
2000	2180.00	40.79	160.96	14	22	8	64
2001	2237.00	41.51	110.53	16	17	1	1
2002	2223.00	39.39	80.50	8	8	0	0
2003	2356.00	41.30	135.00	15	19	4	16
2004	2486.00	42.71	196.99	18	24	6	36
2005	2576.00	44.62	159.52	19	21	2	4
2006	2686.00	48.21	151.68	20	20	0	0
2007	2764.00	51.83	118.75	21	18	-3	9
2008	2760.00	54.08	180.34	22	23	1	1
2009	2659.00	54.82	65.53	23	4	-19	361
2010	2767.00	59.50	98.78	24	16	-8	64
TOTAL							**987**

Where $R(x_i)$ = ranking of freight rate, $R(a_i)$ = ranking of fleet size
d_i = the difference in ranking between of freight rate and fleet size
d_1^2 = square of the d_i

Using the formula

$$\gamma_s = 1 - \frac{6 \sum\limits^{n} d_i^2}{n(n^2 - 1)}$$

$$\gamma_s = 1 - \frac{6(987)}{N24(24^2 - 1)}$$

$$= 0.57$$

This shows a strong positive correlation (association) between Freight rate and fleet size. To examine the

strength of this positive correlation using; $t = r_s \sqrt{\dfrac{n-2}{1-r_s^2}}$

$$= 0.57\sqrt{24-2/1-(0.57)^2}$$
$$= 3.25$$

Degree of freedom= n-2= 24-2 = 22
The critical value of t for α =0.05 and 22 degree of freedom = 1.7171
Thus the t_c = 3.25 and $t_{0.05}$ (22) =1.7171
Therefore we reject H_0 and conclude that there is an association between freight rate and fleet size (0.57) or that

freight rate is positively associated with fleet size.

Analysis of Hypothesis 3
H_{01}:   Seaborne trade has no positive association with fleet size

H_{AI}:   Seaborne trade has positive association with fleet size

Year	Seaborne Trade (Millio ton)	Fleet size	Freight rate Million DWT	$R(a_i)$	$R(y_i)$	di	di^2
1987	1343.00	31.90	54.33	1	1	0	0
1988	1488.00	32.11	62.37	2	2	0	0
1989	1661.00	32.62	82.04	3	5	-2	4
1990	1587.00	34.34	87.88	4	4	0	0
1991	1551.00	35.33	89.73	5	3	2	4
1992	1641.00	37.29	59.95	6	6	0	0
1993	1783.00	40.13	72.98	11	7	4	16
1994	1802.00	40.19	73.27	12	8	4	16
1995	1844.00	40.08	82.47	10	9	1	1
1996	1942.00	39.63	92.69	9	10	-1	1
1997	2041.00	38.89	96.83	7	11	-4	16
1998	2070.00	40.42	85.28	13	12	1	1
1999	2108.00	41.70	75.91	17	13	4	16
2000	2180.00	40.79	160.96	14	14	0	0
2001	2237.00	41.51	110.53	16	16	0	0
2002	2223.00	39.39	80.50	8	15	-7	49
2003	2356.00	41.30	135.00	15	17	-2	4
2004	2486.00	42.71	196.99	18	18	0	0
2005	2576.00	44.62	159.52	19	19	0	0
2006	2686.00	48.21	151.68	20	21	-1	1
2007	2764.00	51.83	118.75	21	23	-2	4
2008	2760.00	54.08	180.34	22	22	0	0
2009	2659.00	54.82	65.53	23	20	3	9
2010	2767.00	59.50	98.78	24	24	0	0
TOTAL							**142**

Where $R(y_i)$ = seaborne trade
           $R(a_i)$ = ranking of fleet size
d_i = the difference in ranking of seaborne trade and freight size

$d_1{}^2 =$ square of the d_i

Using the formula

$$\gamma_s = 1 - \frac{6 \sum\limits^n d_i{}^2}{n(n^2 - 1)}$$

$$\gamma_s = 1 - \frac{6(142)}{N24(24^2 - 1)}$$

$$= 0.9381$$

This shows a strong positive correlation(association) between Freight rate and fleet size. To examine the strength

of this positive correlation using ; $\quad t = r_s \sqrt{\dfrac{n-2}{1-r_s{}^2}}$

$$= 0.9381 \sqrt{24-2/1-(0.9381)^2}$$

$$=12.701$$

Degree of freedom= n-2= 24-2 = 22
The critical value of t for α =0.05 and 22 degree of freedom = 1.7171
Thus the t_c = 12.701, $t_{0.05}$ (22) =1.7171
Therefore we reject H_0 and conclude that there is an association between seaborne trade rate and fleet size
(0.9381) or that seaborne trade is positively associated with fleet size

CONCLUSION

The study shown that there is a positive association between freight rate and fleet size with the correlation
coefficient of 0.660. This implies that as seaborne volume grows, ship owners need to adjust their fleet size to
meet the market demand. It also shows that freight rate plays an important role in the tanker shipping market as
high freight rate affects ship owners' decision on their shipping capacity. When freight rate increases, ship
owners places more order to build new ships and the vessel price will increase. At the same time, the price of
second-hand ships also increases as second-hand ships are substitutes of new building vessels and can be
deployed to shipping market in a relatively short period of time.

REFERENCES

Adland R, Cullinane K (2006a) The non-linear dynamics of spot freight rates in tanker markets. Transp Res E
42(3):211–224

Adland R, Jia H, Strandenes S (2006b) Asset bubbles in shipping? An analysis of recent history inthe dry bulk
market. Marit Econ Logist 8(3):223–23324 2 The Tanker Shipping Market

Alizadeh AH, Nomikos NK (2006) Trading strategies in the market for tankers. Marit Policy Manag 33(2):119–
140

Beenstock M (1985) A theory of ship prices. Marit Policy Manag 12(3):215–225

Chen YS, Wang ST (2004) The empirical evidence of the leverage effect on volatility in international bulk
shipping market. Marit Policy Manag 31(2):109–124

Clarkson Research Studies (2010) Oil and tanker trades outlook. ClarksonResearch Studies, London

Dikos G (2004) New building prices: demand inelastic or perfectly competitive? Marit Econ Logist 6(4):312–
321

Dikos G, Marcus H (2003) The term structure of second-hand prices: a structuralPartial equilibrium model. Marit Econ Logist 5(3):251–264

Glen D, Martin B (2002) The tanker market: current structure and economic analysis. The handbook of maritime economics and business, LLP, London

GOULIELMOS A.(2001), Operational Management of Shipping Companies,Athens, StamoulisPublications, pp. 457

HOFFMAN D., BATESON J.(1997), Essentials of Services Marketing, USA, The Dryden Press,pp. 48.

Knapp S, Kumar SN, Remijn AB (2008) Econometric analysis of the ship demolition market. Mar Policy 32(6):1023–1036

Lun YHV, Quaddus MA (2009) An empirical model for the bulk shipping market. Int J Shipping Transp Logist 1(1):37–54

Lun YHV, Pang KW, Panayides PM (2010) Organizational growth and firm performance in the international container shipping industry. Int J Shipping Transp Logist 2(2):203–226

McDONALD M. (1999), Marketing Plans, England, Butterworth-Heinemann, 4th Edition, pp.34.

PLOMARITOU E. (2006), Marketing of Shipping Companies, Athens, Stamoulis Publications,pp. 11.

Stopford M (2009) Maritime economics. Routledge, New York

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