Product Tanker Pool or Free Market? A Behavioral Approach

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Abstract
In the strategic policies for management of cargo ships, a shipowner evaluates the strategic alternative economically more favorable between hypotheses of choice at his disposal. In this article, we consider in particular behavioral approaches relating to the decision of product tanker pool or free market; which is the better strategic alternative? The main objective of this study is to estimate the more advantageous of these two strategic alternatives with the best risk profile for the shipowner. The correct decision will allow to obtain the best returns, thereby ensuring greater guarantees. Methodology is based on a choice criterion of the optimal business by a Multinomial Logit Model (MNL), which appraises the behavior of a shipowner in his decision making process. The result is to test an experimental application in maritime transport of oil products.

Introduction

The objective of a pool is to outperform the shipping markets, hence providing superior returns on shipping investment to customers, partners and investors.
A pool *is a collection of similar ship types under various ownerships...* (Packard W.V. 1989) of the same sector.
Dynamic managementof a pool's shipping portfolio occurs through the employment of a unique approach integrating time-charter trade and ship owning with active freight, whilst implementing and developing advanced risk management and technology and performing to the highest industry standards of quality service and management.
In this article, we consider a ship owner whocan choose between twodifferent strategic alternativesto manage his vessels,consideringthepossibilityof entrustingthe vessel to a poolwith varying risk profiles (lower, moderate and high) or to opt for the marketwith two risk profiles(time charterand voyage charter).
The main objective of this study is to estimate the moreadvantageousof these two strategic alternatives with the best risk profile for the ship owner as mentioned

above.The correct decisionwill allowthe ship owner toobtain the best returns,thereby ensuringgreater guarantees.
The chosen criterionof the optimal business considers a Multinomial Logit Model (MNL), which appraises the behavior of ship owners in their decision making process.
The model uses a randomutility function with variables includingaverage time charter,grossfreight, market risk, time/voyage charter.The database used in the model derives from aStated Preference survey (SP)provided by shipping companies.

Demand and supply dynamics of product tankers

From an overall viewpoint, it is interesting to report some information about the demand and supply dynamics and earningsof product tankers in the year 2014.
In general, freight rates are always difficult to predict and on the global economic scene, the only sector currently making high market returns, and with similar future prospects, is crude oil tankers. It is no surprise, therefore, that owners are investing in oil shipping.
The demand forcrude oil tankers is seasonally strong at present. So what is fueling the stronger freight market? It can only be new building, because the oil tanker demolition segment has contributed very little, in line with the all-year BIMCO forecast (2015).
In the product tanker sector, the drop in oil prices may have stimulated demand for LR1, LR2, Handy size and MR immediately, since they are separate segments.Handy and MR then caught up in a market in which the prices suddenly moved upwards as compared to the rather flat and steady oil prices. The freight rate at the end of 2014 was at a six-year-high for all product tankers.
Intheyears from 2008 to 2013,thedemand for product tankersshowsgrowth of about4.6% y-o-y in 2013 (table 1).Moreover,it also highlights that entrepreneurial choices have favored product tankers of larger dimensions (80,000-120,000 dwt). These vessels have been purchasedat the best conditions, increasing their demandbyabout 16% in 2013 compared to the previous year;the same applies to medium class vessels(60,000-80,000 dwt).
Throughout the same period, on the other hand, supply ispositive(table 2) and characterized by the presence of a fleet surplus.

Table 1 Product tanker demand 2008-2013

Clusters dwt	Mlndwt						Years 2008/2012 % change	Years 2012/2013 % change
	2008	2009	2010	2011	2012	Trend 2013		
10-60.000 dwt	53.7	53.3	53.7	54.6	53.4	51.0	-0.6	-4.5
60-80.00 dwt	14.2	14.1	13.3	12.7	13.3	15.4	-6.3	16
80-120.00 dwt	21.7	21.0	21.4	24.2	28.8	33.4	32.7	16
total	*89.6*	*88.5*	*88.4*	*91.6*	*95.5*	*99.9*	6.6	4.6

Source: Clarkson Oil and Tanker Trades Outlook 2013

Table 2: Product fleet growth 2008-2013

Clusters dwt	Mlndwt						Years 2008/2012 % change	Years 2012/2013 % change
	2008	2009	2010	2011	2012	Trend 2013		
10-60.000 dwt	54.9	59.3	60.4	61.6	62.6	64,8	14,0	3,6
60-80.00 dwt	17.1	19.3	20.9	22.6	23.2	24,1	35,7	3,8
80-120.00 dwt	20	23.5	26.1	27.2	27.5	27,6	37,5	0,3
total	92	102.2	107.4	111.4	113.3	116,5	23,2	2,8

Source:Clarkson Oil and Tanker Trades Outlook 2013

A cross analysis of the whole sector (2008-2013)generates a different progress profile: in effect, the increasing dynamic of supply compared to demand reaches a surplus ofabout 20 Mln dwt.This produces a criticalsituation in whichmarket fluctuationscreate the conditionsfor lowering freight rates, resulting in reduced profits and forcingship owners into financial speculations.

In these markets,orders have dried up,butduring the first half of 2014, 57 new ships were ordered. This year is set to be another big delivery year for MR with 75 being delivered so far and 15 potentially still to come. Thus, 2014 has already topped the total for 2013,which saw 72 new MR, and the MR fleet has grown by 7.4% year-to-date.

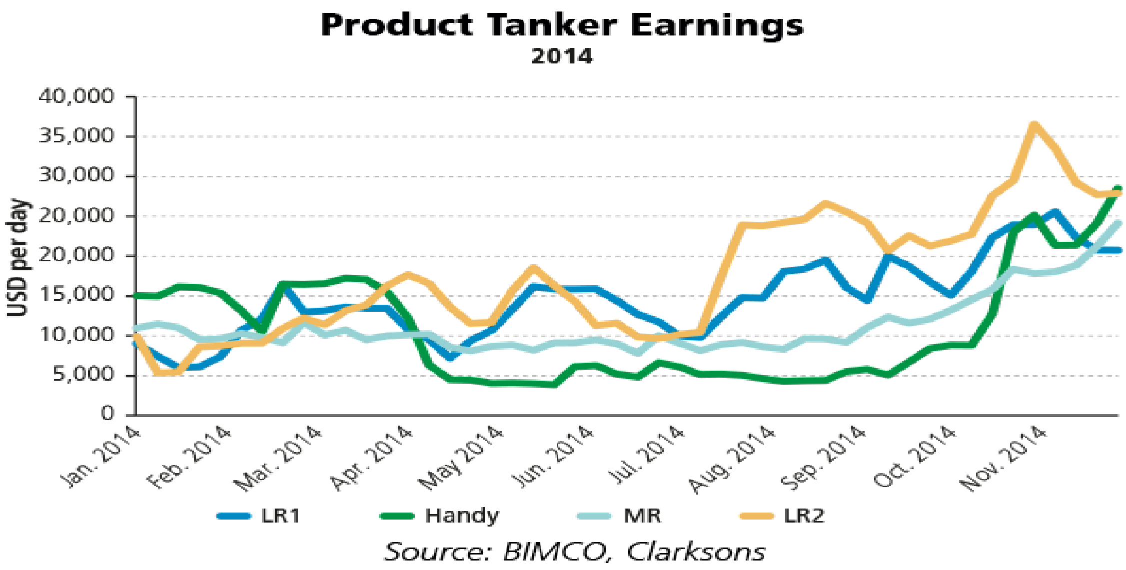
Market conditions in the first half of the year resulted in a large number of postponements taking place butannual supply growth is still strong.Cancellations and postponements of investment in the oil industry may follow, reducing production and oil prices.

Lower oil prices may continue to generate higher demand for product tankersand could lead to some positive trends. This will happen in the case of seasonally lower oil demand and an unchanged level of oil supply, because producers need time to adjust output to a new normal level.

In this segment, with a supply that increased from last year –and which is set to go even higher in 2015– the efforts made by individual owners to alleviate the pressure from oversupply appear to be bearing fruit. Going forward,it is important for product tankers not to depress freight rates.

Earnings in 2014,on the benchmark routes for LR1,remain around USD 15,000-25,000 per day; LR2 are also enjoying a stronger market, around USD 20,000-35,000 per day;handy perform strongly at USD 18,000-30,000 per day, with MR averagingaround USD 12,500-25,000 per day, as shown in Figure 1 (BIMCO, Clarkson 2015).

Figure 1: Product tanker earnings 2014



Workability of Pools

Thereare numerous different types of pool; in our case, we have considered Product Tanker Pools covering various size ranges of ships.The Pool Distribution System evaluates vessels on their TCE (time charter employment) performance on certain FFA (Forward Freight Agreement) routes and their trading characteristics such as DWT, IMO status, loading capacities, trading exclusion.
The purpose of a pool is to secure the highest possible earnings for participants through the commercial employment and operation of vessels in the pool.
Pool Earnings are pooled together and distributed to the participants on a monthly basis, according to thepool points of each vessel and trading days in the relevant period.
The managementand controlof business activitiesare guaranteed by thePoolAdministration; in this way,ship owners can take advantage of the experience of an independent commercial team whichworks to make the best use of ships.
The pool optimizes market results and the distribution of profits to the owners,especiallyby means ofcontracts of affreightment, fleet optimization, a strong marketing position, penetration of protected markets(Haralambides H.E. 1996)
The Pool Administrationenters effectively into a contract as a single entity and may transact and conclude a series of operations,negotiating voyage/time charter and better financing possibilities.
In such a way, with careful managementof the client portfolio,thepool tries to guarantee the highest revenue distribution to the members according to the conditions stipulated in the contract, providing ship owners with the best possible service and reducing risk linked tomarket fluctuations.
The contracts have exact durations from individual quarters up to several years.
Briefly speaking, the choice of a pool is important in order toachieve above:
-market returns by placing vessels in shipping pools

-provide ship owners and traders with a better and more reliable service
- reducing their performance risk and increasing their average returns
-benefit from a range of products for different risk profiles offered by the pool management.

In this paper, we willattempt to evaluate the conditions in which the strategic choice of a pool may be the best alternative for the owner. However, freight rates, voyage expenditure, revenue forecasts,quality of transport services, type of load, route and destination of the cargo, are all essential elements to consider in relation to decisionsconcerninga pool.

Literature review

Behavioural model.The behavioral models attempt to explain the freight and passenger transportation as the result of a process of utility maximization by a known decision-maker.A brief chronology ofthe most significant developmentsof thebehavioral theorycanbesummarizedthus.
Thurstone in 1927 introduced the law in which the alternative choice for the perceived usefulness differs utility systematic less than a random error and demonstrates its probabilistic approach. Marschak in 1950 generalized the law of Thurstone and analyzed the relations between the random utility functions and choiceprobabilities, creating RUMmodels. Lucein 1959showed that the ratio of the probability of choice for i and j is the same for each set of choices and called IIA(Independence from Irrelevant Alternatives). Quandt and Baumol in 1996 apply a model of modal distribution in the analysis oftransport demandof a multimodal corridor by binomial and multinomial logit The inclusive utility was introduced as a weighted average of the probabilities of systematic utility and Ben-Akivain 1973 develops the log sum formula for the exact calculation of inclusive values. Others examples may be found in Watson, Hartwig and Linton (1974).McFadden in 1974 and Ben-Akivaand Lermanin 1985 justify the use of models RUM in nested logit application. This approach leads to the development of GEV models, while the analysis ofDaly 1987places the basis for the equivalence between the RUM choice model and those based on consumer utility.Daughety (1979),Daughety and Inaba(1981) provided a more extensive but similar modeling framework which is grounded in the economic theory of the firm McFadden , Winston , and Boersh-Supan A. (1985).
Ben-Akiva andMorikawain 1990 developa jointly revealed preferences (RP) and stated preferences (SP) analysis. From 1990 onwards there is a further development of models of choice consistent with the approach RUM, including GEV and hierarchical model. For detailed Regan andGarrido (2000) and McFadden (1989).
Interesting in the desegregate - behavioural contest the work of Abdelwahab and Sargious (1992) and Abdelwahab (1998) tackle the simultaneity of the decisions in the freight market, through a utility maximisation discrete-continuous joint decision model for mode choice and shipment size.
McFadden and Train in 2000, Trainin2000 and 2001, Train and Sonnierin 2005, and Train in 2008a-bdeveloped a mixed logit model from Bayesian approach, with correlated or uncorrelated parameter . One of the moreadvanced applicationon panel data management.

*As regards the shipper-carrier behavioural interaction*there aredifferent studies, Gilmour (1976),McGinnis (1979), Gray (1982), examine shipper perceptions of freight modes. Yield, speed and reliability, rather than cost are the attributes of modes considered most important to the shipper - carrier interaction. Three other examples are presented by Boerkamps, Van Bingsbergen and Bovy (2000), Holguin-Veras J. and Walton C.M., (1996), Holguin-Veras (2000), Catalani(2008). The formers describes a commodity-based freight model that incorporates supply chains. The latter estimate intermodal freight carriers based on profit maximization, market equilibrium and intelligent technologyof container terminal management. The third the ship owner behavioural choices in port accessibility andmaritime routing.
As regards the shipper -carrier relationship some of the mode choice models analyze the option of using vehicles of one's own fleet. Hall and Rancer (1995) describe a decision support system that allocates vehicles in the presence of private fleet and carrier option. On the contrary, Crum and Allen (1990) examine the impact of logistics strategies of JIT systems on shipper-carrier relationships.
Quandt and Baumolin 1966analyzed the level of service for different transport aggregate modes based on land use characteristics. The model utilizes a gravity demand function with inelastic modal splitting.Morton (1969), Boyer (1977) based their analysis on aggregate logitfreight rates and level of service for each mode. Catalani–Zamparelli(2010) analysed the shipper-carrier interaction of a leader company on home care exports from Italy. Cascetta (2001) with an overall and complete volume on transportation planning, Catalani and Zamparelliin 2010 based their analyses on desegregate data of RP survey on board a cruise ship to test a behavioral model of passenger pricing choosing with MNL and HEV model.
Pool agreements. The idea behind bulk shipping pools is that usually similar tonnageis pooled together and there is not much scope in trying to enter a bulk carrier, a tanker and a reefer in the same pool. No matter how appealing such an idea might appear, the predominant reason for creating a pool, as explained below, is the possibility of undertaking large contracts of affreightment(COA). Packard in 1989: "*...a pool is a collection of similarvessel types under various ownerships, where weighing earningsare distributed to individual owners under a pre-arranged system".* Successively Murray, in 1994, defined shipping pools "*...joint ventures between shipowners to pool vessels of similartypes, with central administration…"*Haralambides, in 1996,resumes the thought of the two previous authorsin complete manner structure and operations of bulk shipping pools.
In March 2005 EU sentenced that Shipping Pool Agreements could beillegal**.** Shipping pool agreements need to be reviewed and possibly revised, if they are to meet newEU regulations.

In 13th September 2007 EU Antitrustdrafts guidelines for maritime transport companies have to themselves assess whether their agreements with other companies, whether competitors, suppliers or distributors, comply with EU competition rules operating under a single administration (e.g. a pool manager) responsible for the commercial management and the commercial operation as Packard, Murray, Haralambides.
BIMCO publishes in 2012the industry's first standard pooling agreement for use by tramp pools operating in dry and liquid bulk trades primarily on a COA or spot basis.
Lorenzon and Nazzini in 2009 argued that Maritime Transport Guideline of EU do not provided any indication as the circumstances in which may constituent an infringement of art 81 by object. As regards, on the contrary, fixing price element it increases significantly the risk for the pool managers and the participating ship owners.

Actually we have operative, in all maritime transport of passenger and freight, over the world, about 1500 pools as Federal Maritime Commission 2015.

Random Utility Maximization theory (RUM)

In the economic analysisconducted in thefield oftransportwide useis made ofdiscrete choicemodelsthat helpto describe, understand and predictthe decisions of the operatorsand in whichthe choice set isrepresentedby afinite number of possibilities.
The developmentofthese modelsis founded uponthe random utilityfunction andits maximizationbydecision-makers(RUM-RandomUtilityMaximization).This wasintroduced for the first time in 1960 byMarschak who contributed to its theoretical development.
Thetheoryofrandomutilityconsidersthe choicesof individualsusing theprobabilistic approach. Analysts do not know how the next person will behave,sothey will use a survey based on a statistically relevant sample.
In this articlewe have used a sample based on therepeated choices of different owners (D'Amato Group).
RUMmodelsconsiderthat theindividual willchoosethe alternative*j*withthe maximum utility.
The outputofthese modelsprovidestheprobabilityof each alternative for each individual.
Random utility models are therefore based on the assumption that every operator is a decision maker who maximizesthe utility relative to hischoices.
Under this hypothesis, it is not possible to predict withcertainty whichalternativethedecision maker will choose, while it is possibleto knowthe probability that chooses the alternativej,asthe probability that this alternativehas perceivedutility greaterthan all other available alternatives (McFadden D. and Winston C. 1981):

$$p^i\left[j/I^i\right]=\Pr\left[U^i{}_j > U^i{}_k;\forall k \neq j, k \in I^i\right] \quad (1)$$

The perceivedutilityU^i_jcan be expressed by the sum of thesystematicutility*Vij*, which represents the meanof the expected value ofperceivedutility among all users with the samecontextofchoiceforthedecision maker*I* (alternatives and attributes), and arandom residual$\varepsilon^i j$thatrepresents the gap of perceived utility by I from thatvalue

$$U^i{}_j = V^i{}_j + \varepsilon^i{}_j;\forall j \in I^i \quad (2)$$

and

$$p^i\left[j/I^i\right]=\Pr\left[V^i{}_j - V^i{}_k > \varepsilon^i{}_k - \varepsilon^i{}_j;\forall k \neq j, k \in I^i\right] \quad (3)$$

Thechoice modelshown in(3) is represented by a choicemapthat associates to eachvector ofsystematicutilities$V_i$avector ofchoice probabilitypi=pi(Vi),whose components are, by definitionofprobability, in the range[0,1].
From(3) it is clearthat thechoice probabilityof an alternativedepends on the valuesof thesystematicutilityofallavailable alternativesandonthe lawofjoint distribution ofresidualrandomε^ij.
A dummy variable is introduced in the systematic utility of generic alternative j: its value1for alternative j and 0 for the all others. This variable is called the ASA (Alternative Specific Attribute) and its coefficient β is noted as Alternative Specific Constant (ASC). This constant is a kind of known term of the systematic utility.These general notes about random utility models will be used later in this study.

Multinomial logit model

The Multinomial logit model (MNL) is well defined in literature.The model, through selected and advanced applications, reviews the impact of obvious and non-obvious attributes, such as market risk,highlighting the importance of the Stated Preference (SP) survey data disaggregate for a robust assessment of theparametersof the model (McFadden D. 1974); (Oum T. 1979);(Ben -Akiva M. and Lerman S. 1985). At the same time, it retains a closed analytical expression with multiple observations of the same decision-makerunderlying the multinomial logit model (Ben Akiva M.,MaersmanH., Van de Voorde E.2013).
Also of interest is the desegregate-behavioral model theory of freight demand modeling in the works of Abdelwahab W. and Sargious M. (1992),Catalani M. and Zamparelli S. (2010).
The Multinomial Logit is based on the hypothesis that the random residualsε_j relating to the different alternatives are independently and identically distributed (i.i.d.) according to a Gumbel random variable (r.v.) of zero mean and parameter θ(Cascetta E. 2001).

The marginal probability distribution function of each random residual is given by:

$$F_{\varepsilon_j}(x) = \Pr\left[\varepsilon_j \le x\right] = \exp\left[-\exp(-x/\theta - \Phi\right] \quad (4)$$

where Φ is the constant of Eulero (Φ ≈ 0.577).
In particular, mean and variance of theGumbel variable are:

$$E\left[\varepsilon_j\right] = 0 \quad \forall j$$

(5)

$$Var\left[\varepsilon_j\right] = \sigma_\varepsilon^2 = \frac{\pi^2}{6}\theta^2 \quad \forall j$$

(6)

$$Cov\left(\varepsilon_j, \varepsilon_h\right) = 0 \quad \forall j, h \in I$$

The perceived utilitiesU_j, sum of a constant$V_j$and the random variableε_j, is also a Gumbelrandom variable with probability distribution function, mean and variance given by:

$$F_{U_j}(U) = \Pr[V_j + \varepsilon_j \leq U] = \Pr[\varepsilon_j \leq U - V_j] = \exp[-\exp(-(U - V_j)/\theta - \Phi] \quad (7)$$

$$E[U_j] = V_j \quad Var[U_j] = \frac{\pi^2}{6}\theta^2 \quad (8)$$

The Gumbel variable has an important property known as stability respect to maximization, that is to say the variableU_M:

$U_M = \max_j \{U_j\}$ (9)

is againa Gumbel variable with parameters θ and $V_M$given by:

$$V_M = E[U_M] = \theta \ln \sum_j \exp(V_j / \theta) \quad (10)$$

its analytical structure, is defined "*logsum*":

$$Y = \ln \sum_j \exp(V_j / \theta) \quad (11)$$

The probability of choosing alternative j among those available, belonging to the set of choices (1,2,..m)$\in I$, can be expressed in closed form as:

$$p[j] = \frac{\exp(V_j / \theta)}{\sum_{i=1}^{m} \exp(V_i / \theta)} \quad (12)$$

Expression (12) defines the probability of the Multinomial Logit model, which is one of the most used random utilitymodels.

Data input and MNL model calibration

In this article, a MNL model is applied to ship owners' behavior in choosing either to entrust the management of their ship to a Pool or to entrust it to the free market. In particular, thesetwostrategic alternatives offer, in total, fivedifferent risk profiles.

The detailed risk profiles are:

for the Pool

- lower risk(spot revenue with collar) –protection against sharp market drops. The spot revenue betweenan agreed floor and an agreed ceiling;

- moderate risk(timecharter) – the income is fixed as under a timecharter, giving protection from a declining free spot market;
- high risk(spot Tonnage) – the vessel of an owner is traded in a large pool of similar vessels, optimizing earnings and reducing risk in the short-term freight market. The revenue is a share of the pool's total income and will be benchmarked against spot market indices;

for the free market

- time charter risk –the owners operate in competition and subject to the dynamics of trade oscillation with certain protection only through long-term contracts;
- voyage charter risk – this is higher risk with freight ratesderivingfrom market trends.

The time charter riskandvoyagecharterriskare strongly affected bythe dynamics of thefree market,whereasa pool providesa prompt response to changing market conditions.
In these conditions,the alternativesconsidered(pool and free market) are sufficientlydistinctand,therefore,the hypothesison the independence of irrelevant alternatives (IIA)ofrandomresiduescanbeaccepted.
The input datawereobtained froma survey based onstated preferences (SP)(Hensher D.A, Rose J.M, and Greene H. 2005)of ship owners. It was necessary to definethe typeand number ofattributes to includein the choicealternatives.
The quantitative variablesare:voyage days, gross freight, voyage expenditure, totaldemurrageresult and average time charter; the qualitative variable isthe total risk.
The SP survey is currently organized by games based on Full Factorial Design.The framework of the games was obtained by choosinga subset of scenarios, usingspecific software.
Usingdominance analysis, in respect of the IIA rule, the scenarioswitha dominant preferencewereexcluded. The survey wascarried out on asample of 25ships. The database is confidential.
The structure of the model is represented by the following utility functionU with attributes.
The model also considers the use of AlternativeSpecific Attributes (ASA).

$$U = b1*VD+b2*GF+b3*DMG+b4*VYE+b5*TTL+b6*AVGTC+b7*RSKT \quad (13)$$

Where:

VD = Voyage days
GF = Gross freight
DMG= Demurrage
VYE = Voyage expenditure
TTL = Total result
AVGTC = Average time charter
RISKT= Total market risk

b1,b2,b3.. = coefficients

Gross freight as an equivalent dummy variable interaction (Nlogit4.0 econometric software).

Seven variables were in the application: voyage days, voyage expenditure, total demurrage, result, average time charter, risk and gross freight. The fundamentals are observations related to the possible decision to entrust the vessel to a pool or to the market.
Therepeated answers of ship owners, for this study, are elaborated based ontheir real experience and on market trends(Clarkson, BIMCO v. y.).

Results of model calibration

Inorder to obtain the results of themodelcalibration, in the simulationof random utility, NLOGIT 4.0 software (Greene W. 2007)wasused.
Parameter estimation is shown in table 3 below:

Table 3: Model simulation results

Variables	*coefficient*	*Stdt. Error*	*b/stdt.Er.*	*P value*
Voyage days	7.72765881	6.44961337	1.198	.2309
Demurrage	-2.65294321	2.42512337	-1.094	.2740
Voyage expenditure	-.84507002	2.12841021	-.397	.6913
Totalresult	.93598480	.78273767	1.196	.2318
Avgtchday	.68697246	.47308880	1.452	.1465
Market risk	-.86882078	.45071235	-1.928	.0539
A_2	-1.24181592	60.5220032	-.021	.9836
2xGRO1	-3.45548606	16.1280447	-.214	.8303
A_3	1.64114433	3.30403884	.497	.6194
3xGRO2	-.55395194	.93279807	-.594	.5526
A_4	-6.96599078	5.07277656	-1.373	.1697
4xGRO3	1.49438508	1.32295521	1.130	.2587

***Log likelihood function* = -15.18**

***ρ2*= 0.47**
***ρ2adjst*=0.35**
χ2= 13,59

The first column of table 3 shows the name of the variables, the second showsthe value of the estimated coefficients; the standard error is in the third column, the fourthgives *t*statistics by relationship between the estimated value of the coefficient and standard error, andthe last column containsthe*p-value*, indicating the probability of makinga mistake.

The initial output of the modelhighlightsno probability for lower risk of thepool and no choices for this profile;therefore, itwasexcluded and the analysis is concentrated on fourriskprofiles: moderate, high, time charter and voyage charter.

The results of the application show that themodel has explanatory power with a sufficiently high***R –sqrd***value equal to .47857.
The value of the maximum likelihood (Log Likelihood) is -15.18, although the model still has margins for improvement that could be achieved with the introduction of other dummy variables.
The tests on the t statistic, except for the constant modal A2 linked to gross freight, are significant. The total market risk is considerable.
The choice probability resulthighlights a net preference for the strategic alternative of the pool and its high-risk profile with a value of 0.46, followedbythe other alternatives, with a valueof0.33 for voyage charter market risk and 0.19 for time charter market risk; the moderate risk alternative is not significant.
The probability values are acceptable and confirm the validity of the predictive model with a performance of 71% of estimated alternatives coincident with the actualchoice of theship owner. Furthermore, the probability values also confirm that high-risk pool management is the best choice.

Conclusions

Simulation models in the shipping industry are difficult to calibrate because they need wide-ranging information about the strategic choices of the owners involved in the decision making process. Administration controlled pools are usually transparent and open to scrutiny.
The existence of a pool agreement (including the weighing system) is important forattracting new members.
Our application assumes an experimental form with a model that attempts to simulate the behavior ofindividuals (ship owners) in their decision making process.
Themodal shareattractedby the strategic alternative of the pool, basedonstated preference repeated choices,isprobablyunderestimated.Ship ownersare not willing tochange theirbehavior if the service offered is "weak" in terms ofperformance, economic efficiency and earnings.
Whenthe characteristicsof the service are"strong", on the other hand, such as in the caseof direct managementof thepool, the probability of a ship owner choosing the pool alternative is considerably higherthanthe free market.

Finally, the application is recognized as satisfactory considering its experimental nature,albeit within the limits of the reduced sample used.
The collaboration of shipping companies owning oil product tankers,whichalso operate inside a product tanker pool, was very useful for this paper.
It seems interesting to consider possibilities of extending this application to other maritime sectors. A particularly congenial hypothesis on the future progress of complex models isthe HierarchicalLogit Model, whichallows us to partiallyovercome the assumption of the independent random residual underlying the Multinomial Logit Model (MNL). At the same time, it retains a closed analytical expression.
Another, more advancedmodel is the random parameters Logit Model (mixed logit),which surpassesthe independent and irrelevant alternatives (IIA) and correlation between coefficients of MNL Through these two modelswe can, thus, foresee the development of applications capable of simulating choicesconcerningthe economic-financial aspects of shipping companies.

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