Time Charter or Trip Charter? An Assessment of Market Efficiency in Shipping Market

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This paper explores the economic value of charter hire rate forecasts in the bulk shipping industry for ship operators by introducing a chartering strategy defined as a sequence of different types of contracts that maximises profit. Ship operators are assumed to divide ship use to trip charter and time charter market depending on the quarterly excess charter hire rate forecasts, i.e. the difference between time charter and trip charter (spot) rates. Ship operators use the recursive forecasting approach and switch the chartering strategy across the two positions. The decision is based on economic measurement rather than statistical significance. The economic benefits realized by ship operators who apply our forecasting rules exceed those derived from the fixed policy approach of using either alternative, and will be used to disprove the validity of the efficient market hypothesis. The paper applies the regression methodology and forecasts two steps ahead of quarterly spot prices regressed recursively on fixed variables, thus extending research in terms of the scope of analysis. We have applied statistical evaluation in addition to the economic evaluation and found that the proposed model outperforms the historical mean forecast. This paper emphasizes the importance of a sound diversification strategy within the business platform to target the more profitable business segment and test if macroeconomic indicators and commodity prices are satisfactory indicators for forecasting charter hire rate.

KEY WORDS

~ Charter hire rate forecast
~ Efficient market
~ Decision-making process
~ Time charter
~ Trip charter

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1. INTRODUCTION

The link between decision making and forecasting evaluation in a situation in which economic profit is an appropriate measurement of forecast accuracy, unlike in the general financial literature, has not yet been discussed in shipping economics and the issue of predictability remains elusive in maritime economics. There is no decision support system with regression variables to optimize chartering strategies. Choosing the right policy is crucial for the well-being of ship operators to ensure a healthy stream of income. The research develops a model for determining optimum chartering policies in bulk commodity ocean transport services. The ocean shipping market can be divided into two major markets: 1) the liner market and 2) the bulk market. The former is the market for regular transportation services and transports manufactured cargo in containers. The bulk market is close to pure competition, the liner market is oligopolistic and comparable to the airline market. Ship operators face three decisions with respect to ship utilization:

- charter the ship in the spot market (for one voyage)
- charter the ship in the term charter market (for multiple voyages)

• lay up the vessel (out of operation for a reasonably long period of time to wait for better market conditions, however, laying up comes with "in" and "out" and some maintenance costs, but variable costs are low.

The term spot freight rate as used here refers to the time charter equivalent (TCE) spot freight rate. As hire rates for vessels on spot charters are sometimes not expressed as daily rates, the TCE was used to compare spot and time charter rates.

The decision-making process and freight rate market predictability have been major issues in empirical maritime finance. The fundamental assumption of rational expectations that underlies the efficient market hypothesis is based on the idea that unlimited economic profits would be generated if one could continuously successfully predict developments on the market, and hence, if a market is informationally efficient, it is impossible to beat the market as all the information are already incorporated in the freight price. Therefore, in this research, the predictability of the market will be analysed in terms of economic profit generated by the forecasts.

This paper will use a recursive strategy with out-of-sample forecasting. An advantage of using a recursive modelling approach is that it also allows the out-of-sample forecasting which has received a great deal of attention in empirical financial literature (Sollis, 2005). Recursive strategy decisions are simulated by predicting freight price returns, under the assumption that the ship operator confident in the forecast switches across the spot and term charter market. If the forecast is in favour of the spot market, the ship owner will choose the spot market, otherwise the operator prefers the term charter market. To establish whether returns are predictable and can therefore be used to generate economic profit, the final wealth obtained by choosing either of the options is compared to the final wealth calculated by the forecast; this is also in consideration of the fact that the real-world forecast is based on economic profit.

Most of the short-term shipping market is largely influenced by factors other than the observable macroeconomic fundamentals; however, it has long been believed that in long term the shipping market is driven by macroeconomic factors and commodity prices, although this has not been investigated econometrically and could be mostly wrong. The most fundamental assumptions underlying macro theories are that macroeconomic agents are rational and that the market is efficient. In other words, agents form rational expectations about the future, incorporating all their current knowledge and preferences into decision making.

Moreover, since this paradigm also applies to pricing, the current price of freight must take into account all past information and can only be moved by news (Efficient Market Hypothesis). Under the rational expectations hypothesis, economic agents use all available information about the future in a rational manner to determine the value of an asset. Assuming all economic agents are risk-neutral, the current market price x_t of an asset fully reflects all past and current information relevant for the future value of that asset embodied in the information set Ω_t - the market for the asset is thus informationally efficient. Under the aforementioned circumstances, market efficiency implies that currently available information does not carry any predictive value about subsequent price changes and that consequently the best prediction (i.e. the forecast with the smallest mean squared error) of future prices is simply the current price:

$$E_t(x_{t+1} \mid \Omega_t) = x_t \tag{1}$$

Notable papers by Shiller and Campbell (1988) and Fama and French (1988) both suggest that financial series exhibit predictive power for stock returns. Ang and Bekaert (2007), and Welch and Goyal (2008) have suggested limited evidence of predictability. Paye and Timmerman (2006) argue that breaks exist within the predictive regression, although Lettua and Van Nieuwerburgh (2008) suggest the existence of breaks in predictive variables. If efficiency is viewed as a relative rather than an absolute concept, it can be argued that the more efficient the market, the less predictable its price process, and hence fewer available predictable trading opportunities.

Therefore a perfectly efficient market is characterized by a perfectly random price process, so if asset prices evolve as randomly, the corresponding market must be informationally efficient and if the market is efficient, the market participants must form expectations rationally. McMillan (2003) suggests that non-linear models may provide evidence of predictability. Henkel et al (2011) suggest that predictability does not exist in economic upturn and booms. Pourkermani (2021) suggests that the Dry Baltic Exchange Index can not be predicted due to the day of the week effect. The different testing of random walks has always been rejected in classical shipping literature (Tvedt 2003). The desired chartering contracts are not always available; therefore, an operator may decide to choose an undesired contract, all these may actually affect the decision-making process.

Based on the assumption that the ship is engaged all the time, in the real world, even if a ship operator becomes aware that the rates will be higher next week, he will usually not wait until that time. In these cases, when the trade depends on the number of available ship charters, the stochastic process of the fright rate will not be the Markov process, and future values of the series will be quite dependent on past values which invalidates random walk. There is also the scope of private information in the market and superior information. In shipping literature, Pourkermani (2022) suggests asymmetric predictability between Baltic Exchange Indexes.

It's hard to see how the phenomena of ship owners expecting more income and taking more risks could fit into the rational expectation framework in the freight market. It's important to recognize that rational expectations are not an economic logic, but rather a hypothesis based on certain assumptions. We test if it holds up or does not hold up in the freight market after all. As by its very definition, news content cannot be predicted, the stochastic freight rate process follows a random walk (Samuelson, 2015). The extent of private information and how it affects the prices in shipping have never been examined; the availability of inside information may affect prices which are traded in exchange, however, the economic ecosystem is different in shipping.

2. REVIEW OF PREVIOUS RESEARCH ON "DECISION MAKING"

Literature review on trading on the chartering market is very limited. Tsolakis (2004) and Stopford (2009) argue that due to the integration of shipping markets companies can use revenues generated from chartering operations to cover their financial costs. The first published work with a mathematical formalization of ship chartering decisions was a paper by (Mossin, 1968). Mossin's model considers only the "ins" and "outs" of an operation, i.e. when to lay up the ship. (Devanney, 1971) develops a discrete-time finite-horizon dynamics programming algorithm for ship chartering decisions. In Devanney's analysis, single ship policy was prescribed by the algorithm, while the optimal fleet policy was the result of empirical observation. Devanney's model for optimal marine decision making assumes that each agent has different preferences with respect to risk and future demand. This implies that every agent has a different value function (the value of the Bellman equation 9) and therefore different responses.

A more detailed but less formal development of chartering strategies is presented in (Norman 1982). Norman proposes two approaches: (1) charter portfolios and (2) chartering timing policies. For the portfolio traders, Norman determined the price of risk of the ship owner against ship owner risk preferences based on historical data, which allowed him to identify the optimal mix of ships on spot and term charters. With respect to charter timing, Norman examined the correlation between spot charter and term charter rates such as S=A+Bq, where S is spot rate and q term charter rate. Thus, if S>=A+Bq, opt for the spot contract, if not, choose the term charter contract. The limitation of Norman's paper is that he failed to devise any methodology for identifying an optimal strategy.

Another study of chartering strategy is given by (Taylor, 1981). Taylor proposed a computer-driven simulation model to determine the optimal "fleet mix". Taylor's study also takes into account combined carriers (ships that carry both dry and liquid cargoes). This allows more flexible ship owner operation on both submarkets. Taylor's analysis assumed the existence of a so-called chartering preference function that shows the fraction of long-term charters ship owners are willing to take as a function of a freight index. However, Taylor failed to show how to determine those preference functions and his methodology does not guarantee optimality. (Strandenes, 1984) also argues that ship operators are willing to lease their vessels on long term time charters at freight rates below the current spot freight rate when the spot rates are high compared to the long-term equilibrium freight rate.

As demonstrated, previous attempts at technical analysis were generally either restricted to the freight futures market (Goulas and Skiadopoulos, 2012 and Nomikos and Doctor, 2013) or only focused on determining the optimal investment decisions regarding the sale and purchase of vessels (Norman, 1982; Adland, 2000; Adland and Koekebbaker, 2004 and Alizadeh and Nomikos, 2007), with the exception of Adland and Strandenes (2006) and Alizadeh et al (2007) who focused on the physical freight market.

Unlike the research of Adland and Strandenes, 2006 and Alizadeh et al, 2007, this study investigates inefficiencies to see if they can generate economically significant returns. More specifically, the EMH implies that chartering strategies should be based on available market information. There is considerable empirical evidence supporting the existence of a time varying term premium (Kavussanos and Alizadeh, 2002), which implies that investors should adopt a more active strategy and shift their allocations in response to changing term premiums.

3. METHODOLOGY

The initial forecast equation is:

$$r_t = \infty + \beta x_{t-1} + \varepsilon_t \qquad (2)$$

where r_t is the return, x_t the predictor variable and ε_t white noise. We used recursive forecast which will be discussed. This prediction system updates all available information in real time, and any interruption in the time series will be absorbed by the model since it updates co-effect estimates at every step, and we estimate multivariate models and consider forecast combinations. We estimate a regression which includes 6 predictor variables of macroeconomic type and 4 predictor variables among commodity variables.

The owner of a ship, referred to as ship owner or ship operator, in the bulk market faces three decisions with respect to ship utilization. The assumption that freight rate spread is time-varying in the dry-bulk market is consistent with the evidence offered by Kavussanos and Alizadeh (2001, 2002b) for Capesize, Panamax and Handymax vessels.

- Charter the ship in the spot market (for one voyage)
- Charter the ship in the term charter market (for multiple voyages)
- Lay up the vessel (put it out of operation for a reasonably long period of time to wait for better market conditions, however, laying up a ship incurs "in" and "out" and maintenance costs but variable costs are low.

The research developed a strategy for choosing between the first two alternatives. Although it relates to ship owners, it can also be applied to shippers (companies demanding transportation services). The expression term charter is quite wide; it can pertain to 6 month or 1 year to 2-3 year and 5-8 year charters. For our purposes, the term charter was assumed to be 6 months. The term charter is also known as time charter or period charter. Please note that from the standpoint of investment in the vessel itself, the alternatives are to:

- sell a vessel in the second-hand market
- purchase a vessel in the second-hand market
- order a new vessel (buy a new building)
- scrap the vessel (sell for demolition)

However, only chartering strategies have been examined in this paper. This research applied the regression methodology and forecast two steps ahead of quarterly spot prices regressed recursively on fixed variables. The model constructed a continuous interval recursive modelling and chose between spot or time charter contracts for each period, under the assumption that the spot freight rate followed a stationary nonlinear process. A recursive time model was developed, which allowed relative variables to reflect freight dynamics and signal the optimal policy. The next step was forecasting, where the model determined whether the excess freight forecast for spot or time charter market was positive or negative. The two-step quarterly spot price forecast was then compared to the one-off 6-month time charter option. Finally, the proposed optimal policy was assessed using 2 following approaches:

- optimal policy as if there is no term charter option
- optimal policy as if there is no spot charter option

3.1. The Choice of Regressors

In this section, the choice of forecasting regressors considered by the ship operator is discussed. The operator only chooses candidate predictors that can be accessed, based on prior belief, as well as public information available prior to making the investment decision. The ship operator includes variables which he believes explain freight rate market variations. The ship owner has no uncertainties with respect to the choice of predictors, the specifications of predictive models, and the best forecasts. The demand for shipping services largely depends on seaborne trade, which means the higher the increases in seaborne trade from period to period, the higher the demand for shipping services, and the higher the freight rate. Consequently a positive sign is expected for this variable. Another indicator of economic activity is the price of major commodities, since an increase in the price of commodities such as oil, iron ore, coal or grain is indicative of higher demand for these commodities. Given that most commodities are produced or extracted in areas where their utility is lower than the areas where they are consumed, they have to be transported by ships. Consequently, the demand for shipping services will grow, followed by an increase in freight rates. As a result, a positive sign is expected for this variable. Freight rate market predictability can be identified based on models using lagged freight rate macroeconomic variables and commodity prices. The investor who collects available information from both markets uses a 1-month lag for financial and macroeconomic indicators. The selected variables are a series of 6 quarterly macroeconomic variables and a series of 6 quarterly commodity prices.

Table 1.
Overview of the series of variables.

Overview of the series of macroeconomic variables

Variable	Description	Input
x_1	US CPI-– Annual inflation rate	Original series
x_2	Quarterly treasury bill	1st difference of the logged series
x_3	US industrial production – manufacturing	2nd difference of the logged series
x_4	Michigan index of consumer expectation	2nd difference of the logged series
x_5	Eq alloc (equity market allocation)	1st difference of the logged series
x_6	US PPI - Finished goods SADJ	1st difference of the logged series

Table 2.
Overview of the commodity variable series.

Overview of the series of commodity variables		
Variable	Description	Input
x_1	LME-LMEX Index – Price index (~U$)	1st difference of logged series
x_2	Westpac commodity futures ind - Price index	1st difference of logged series
x_3	Dow Jones commodity index	1st difference of logged series
x_4	London Brent crude oil index U$/BBL	1st difference of logged series

3.2. Switching Strategy

At the time (t) the ship operator tries to forecast the excess freight rate – i.e. the difference between time charter and trip charter rates - on (t+2) quarterly date and establish whether the market will give a positive return at that time, is compared to the six months' time charter option. The same procedure is conducted when information is updated in the following period. If the return forecasts are positive, the ship operator decides to choose the spot freight rate market and if they are negative, he will choose the time charter market. Our strategy is multiple period decision problems to maximize ship operator utility in all decision periods. The model is:

$$\begin{aligned} &Ship\,Returnt = Spot_{FreightRATE} - Timecharter_{FreightRATE} \\ &Ship\,Return_{t+2} = \alpha + \beta x_{t+1} \\ &If\,Ship\,Return_{t+2} > 0 \\ &Ship\,Return = Spot\,Freight\,Rate \\ &If\,Ship\,Return_{t+2} \leq 0 \\ &Ship\,Return = Time\,charter\,Freight\,Rate \end{aligned} \quad (3)$$

In the switching trading strategy, the approach is to set up a predictive model of two-steps ahead returns by using quarterly information and calculating future returns with that fixed model. In general finance, (Pesaran and Timmermann, 2000) show that the predictability of S&P 500 stock returns can guide an investor to switch asset holdings between market portfolios and treasury bills and exploit net profit over a buy and hold strategy. An extended version this paper is based on, applied to the UK stock returns, has also been done by (Pesaran and Timmermann, 2000). Investors in these papers commonly switch their portfolios between a stock market portfolio and a short-term treasury bill in their markets depending to a set of forecasts on excess stock returns for each period. (Pesaran and Timmermann, 2000) divided potential regressors into three types, with every model starting with all core variables in set A allowing the introduction of new variables from sets B & C into the predictive model. We may simply assume that the investor chooses to predict variables from the same set of regressors in every period.

Forecasts are evaluated by looking at the measures based on forecast error size and sign. Mean squared error (MSE) is forecasted and different forecast performance elements are applied. MSE is as follows:

$$MSE = \left(\sum^{\tau}_{t=1} (r_t - r^f_t)^2\right)/\tau \quad (4)$$

where τ is sample size, r_t return and r_t^f the forecast series. Clark and West (2007) test has been used to provide a measure of statistical significance of the sample R-squared as follow:

$$R_{OOS}^2 = 1 - \left(\frac{\sum^{\tau}_{t=1} (r_t - r^{f_2}_t)}{\sum^{\tau}_{t=1} (r_t - r^{f_1}_t)}\right) \quad (5)$$

where τ is forecasted sample size, r_t return and $r_t^{f_i}$ the forecast series Other economic forecast measures have also been taken into account, including the success ratio (SR) which calculates the proportion of correct forecast signs:

$$SR = \sum_{t=1}^{r} s_t \; where \; s_t = I(r_t r^{f_i}_t > 0) = 1; 0 \quad (6)$$

SR value 1 indicates perfect sign predictability, while 0 is indicative of no predictability. Then the trading strategy as discussed in the ship operator forecast is devised and the market selected. π is the outcome of the trading strategy, the series is used to obtain a Sharpe Ratio which we have attempted to calculate as mean profit reduced by any of other term or spot alternatives.

$$Sharpe = \frac{\pi - r_f}{\sigma} \quad (7)$$

4. RESULTS

4.1. Empirical Results

The shipping data have been provided by Clarksons Research Co., and the rest of the data by Thompson DataStream. The forecast period is from 1999-Q3 to 2020-Q4. The results show that the given strategy would benefit ship operators. The exact daily figures obtained when the strategy is used compared to not following the strategy are shown in table 2. Four sets have been evaluated; two sets of Handymax and Capesize sample freight rates each with two sets of regressors. They are categorized as follows:

Table 3.
Data set.

Independent data sets	Forecasting evaluation data sets	Results
6 quarterly macroeconomic data	Handymax dry bulk	Table A
	Capesize dry bulk	Table AA
4 quarterly commodity date	Handymax dry bulk	Table B
	Capesize dry bulk	Table BB

Table 4.
Summary statistics.

Variables	Mean	Median	SD	Skew	Kurt	Unit root
6 quarterly macroeconomic data						
x_1	0.171	0.262	0.785	0.920	3.800	-9.455
x_2	2.841	2.889	0.436	0.741	2.853	-3.698
x_3	1.175	0.996	0.612	2.152	7.82	-2.952
x_4	0.395	0.249	2.745	-0.485	11.165	-5.652
x_5	0.244	0.345	2.412	1.831	4.225	-5.658
x_6	0.523	0.456	0.212	0.922	2.475	-1.485*
4 quarterly commodity data						
x_1	0.011	0.015	0.021	-0.755	3.502	-2.288
x_2	0.921	0.845	0.955	-0.005	6.852	-3.065
x_3	0.745	0.772	0.272	0.285	2.080	-1.572
x_4	1.540	1.851	4.015	-0.645	5.321	-2.855
Handy ret.	29.562	27.921	3.556	0.645	3.752	-14.356
Cape. ret.	37.475	39.252	4.132	-0.325	4.025	-11.012

Predictor variables selected are commonly used in market prediction (see Hammerschmid and Lohre, 2018). Predictors have been divided into macro economy-oriented or commodity-oriented. Although far more variables were originally chosen, only the significant variables have been kept, while omitting the rest. Table 4 gives summary statistics for the data used in forecast models.

An important issue concerns the stationarity of variables; the final column is the DF test (Elliot et al, 1996) which reveals the non-stationarity of data. Much of the data were stationary and stars indicate non-stationarity. All predictors except one series were stationary, which supported their use in the forecast system. Table 5 gives the estimations, the significance is reported based on Newey-West t- statistic, the statistical significance is 5%. The initial regressor sample was much larger but given that most regressors were insignificant, they were removed from the paper.

Table 5.
Predictability estimates.

Handymax					
β – Macroeconomic all regressors					
x_1	x_2	x_3	x_4	x_5	x_6
0.50*	0.35*	3.28*	1.14*	1.77*	3.35*
β – Commodity all regressors					
x_1	x_2	x_3	x_4		
2.38*	0.67*	0.62*	-0.36*		
Capesize					
β – Macroeconomic all regressors					
x_1	x_2	x_3	x_4	x_5	x_6
0.95*	1.25*	0.88*	2.11*	2.14*	2.87*
β – Commodity all regressors					
x_1	x_2	x_3	x_4		
1.45*	-1.65*	1.33*	-0.80*		

Table 6.
MSE and components.

Predictor vars	MSE*100	Bias*100	Variance	Covariance
Handymax				
HM	1.813	0.211	0.885	0.985
Macroeconomic	0.0089	0.0021	0.044	0.478
Commodity	0.00657	0.00526	0.065	0.0228
Capesize				
HM	3.546	0.535	0.249	0.856
Macroeconomic	0.0096	0.089	0.0199	0.0707
Commodity	0.0588	0.0674	0.0925	0.0602

Table 6 presents MSE measures and components, with forecasted historical mean (HM) being the bases for comparison. This part may help compare the forecast model used with any other model and examine the bias to establish the accuracy of the forecast compared to other forecasts. The results show that MSE value multiplied by 100 performs poorly in HM forecast, but excellently in macroeconomic forecast. Bias value assessment also suggests that macroeconomic forecast outperforms other forecasts. Both macroeconomic and commodity forecast outperform the historical mean forecast.

Table 7 is better for suggesting reasonable forecast performance than any other forecasting method. It presents forecast results based on the out of sample R-squared ($OOSR^2$) and success ratio. $OOSR^2$ is the comparison between the historical mean and predictor forecasts. Multivariate predictors had positive value.

Table 8 is a forecast assessment based on correct trading signals. Table 9 gives Sharpe ratio as discussed earlier, as well as the certainty equivalence value (CEV). All variables have high Sharpe ratio and CEV.

Table 7.
Out of sample R^2 and success ratio.

	Handymax		Capesize	
Predictor vars	Oos R-squared	Success ratio	Oos R-squared	Success ratio
Multivariate regression				
HM		0.60		0.65
Macroeconomic	0.086	0.89	0.092	0.91
Commodity	0.076	0.86	0.083	0.88
Macroeconomic				
x_1	0.66	0.069	0.65	0.077
x_2	0.75	0.081	0.70	0.079
x_3	0.68	0.084	0.65	0.082
x_4	0.85	0.079	0.85	0.091
x_5	0.10	0.025	0.23	0.007
x_6	0.64	0.083	0.45	0.050
Commodity				
x_1	0.93	0.094	0.67	0.00.69
x_2	0.55	0.040	0.85	0.091
x_3	0.45	0.036	0.95	0.085
x_4	0.86	0.068	0.69	0.060

Table 8.
Sharpe ratio and CEV.

	Handymax		Capesize	
Predictor vars	Sharpe ratio	CEV	Sharpe ratio	CEV
HM	0.074		0.185	
Macroeconomic	0.187	5.217	0.176	6.319
Commodity	0.175	4.249	0.165	3.958

4.2. Macroeconomic Variables Result

Table A suggests that if the Handymax operator chooses the term charter, his total income will be USD1,957,389 and if he chooses the voyage charter market, USD1,986,473. Consequently, he will earn USD2,114,818 by choosing the proposed switching strategy.

According to Table AA, if a Capesize operator opts for the term charter, his total income will be USD3,958,174 and if he chooses the voyage charter market, USD4,058,525. Consequently, he will earn USD4,245,042 by choosing the proposed switching strategy.

According to Table B, if a Handymax operator chooses the term charter, his total income will be USD1,957,389 and if he chooses the voyage charter market, USD1,986,473. Consequently, he will earn USD2,078,870 by choosing the proposed switching strategy.

According to Table BB, if a Capesize operator chooses the term charter, his total income will be USD3,958,174 and if he chooses the voyage charter market, USD4,058,525. Consequently, he will earn USD4,168,697 by choosing the proposed switching strategy.

Table 9.
Comparison of strategy takers with the spot market.T

Data sets	Evaluation sample	% more income compared to time charter rates
6 Macroeconomic	Handymax dry bulk	8%
	Capesize dry bulk	7.2%
4 Commodity	Handymax dry bulk	6.6%
	Capesize dry bulk	5.3%
Mean Capesize: 7 % Mean Handymax: 6.4%		

According to Table 9, by using this strategy the ship operator will be better off by the total average of 6.7%, which is a substantial sum of money and enough for the forecast to be considered efficient, as it covers more than ship mortgage expenses.

5. SUMMARY AND CONCLUSION

The freight market is a vital part of the shipping industry and this paper is an attempt to improve the understanding of a ship operator's decision-making process. Choosing the proper strategy in chartering creates an opportunity to maximise profit by choosing the best mix of either time charter or spot charter contract. In other words, chartering strategy is a sequence of different types of contracts. As freight rate fluctuations and the evaluation of different freight sectors depend on supply and demand, a commodity and a macroeconomic dataset is complied. Based on quarterly data, we proposed a new methodology that uses recursive forecast which compiles a MATLAB code based on two sets of macroeconomic and commodity data and assessed the economic potential of freight rate forecasts using economic measurement.

The forecast is generated from forecast combinations. Both economic and statistical significance of the forecast based on linear models were used. The forecast was made from the perspective of a ship operator operating a Capesize and a Handymax dry bulk vessel, who is trying to maximize his profit. In all cases, the results showed superior economic performance where the proposed strategy was used. The results are interesting in as much as they support or contrast with general financial literature. Forecast obtained using industrial production index, 3-month treasury bill and LME index is superior to historical mean.

The subject of this research was economic measurement capable of showing improvements over time. One notable issue is the existence of unobserved systematic or unsystematic forecast errors which caused the forecast to deviate from the historical mean. The importance of this research lies in the ability to successfully conduct economic measurement when statistical measures may not be accurate. We have used recursive forecast which updates the out of sample forecast at every step, and these updates themselves may suffice to overcome some of the shortcomings and temporary errors.

Although there are considerations in the shipping market which make any EMH assessment ambiguous, the results presented in this paper can be used to disprove the EMH. In spite of statistical measurement of forecasting accuracy not generally being capable of adequately predicting both series, economic profit can still be generated by adopting this strategy. A suggestion for further research is to repeat this research with rolling instead of recursive forecast, or make a separate forecast for economic recessions and booms.

CONFLICT OF INTEREST

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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