Container Shipping Market Analysis and Prediction

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International shipping of containerized commodities is indispensable for global trading firms to thrive in the increasingly competitive economic environment. The containerized trade increases four times faster than that of the world seaborne trade from 1985 to 2007. This demonstrates the increasing role of container transportation and its contribution to the global economy.

However, the fluctuation of the shipping market, coped with the global financial crisis, has unhinged the profitability in the container shipping industry. According to supply chain digest (Oct. 2008), the rate to ship a container from Asia to Europe plunged from $2800 to $700 at October 13, 2008. According to Drewry Shipping Consultants Ltd., compared with 2006, global carriers moved 14.7% more cargo, but earned 1.2% less revenue in 2008.

Many people addressed the fluctuation of shipping freight rate. In Maritime Economics (3rd Ed), Martin Stopford described the shipping cycle in the past 266 years, discussed its characteristics, frequency, and prediction difficulties. Tinbergen and Koopmans, two well-known pioneers in the econometrics, actually started econometric analysis in shipping. Beenstock and Vergottis (1989, 1993) studied the tanker and dry bulk shipping markets using annual data. However, there is no such model for container freight market, perhaps due to the comparatively shorter history in container shipping.

To help the global carriers in the container shipping industry and public agencies concerned with maritime transportation, the Department of Logistics and Maritime Studies in The Hong Kong Polytechnic University recently carried out a research on the major factors that determining the fluctuations of the global container shipping market, based on the observed data in container shipping market during the past 28 years. An academic paper from this research titled "An econometric analysis for container shipping market" has been published in Maritime Policy & Management (Luo *et al*., Volume 36, issue 6, December 2009, pp. 507-523). This article intends to summarize the academic paper in non-academic term, so that the decision makers in shipping business can make use of the research result in their business decision making process.

Similar to other markets, the freight rate in container shipping market is also determined mainly by two major forces - the supply for the container shipping service and the demand for this service. Basically, the annual world supply of container shipping service can be represented by number of TEU slots deployed in the shipping industry and the *slot reuse rate*, whereas the demand of such service can be approximated by the total number of containers shipped in a year. Basic economic model explains the determination of market price by equating the supply with the demand. Periodic price fluctuation is often explained by Cobweb model, assuming supply rigidity and alternative excessive supply and excessive demand. However, due to the irregular fluctuation in the shipping freight rate, it is not possible to adopt these existing market models to analyze the shipping freight rate change.

Therefore, the first postulation in this paper is that the shipping freight rate changes with the relative increase in demand and supply. If the increasing amount in demand is higher than that in supply, the price will increase; otherwise, it will decrease. This assumption allows irregular pattern in freight rate change. There can be no fixed periods for the up and down in the market freight rate.

On the supply side, the increase in shipping capacity is assumed to be the net effect of new building and the scrapping. To simplify the analysis, scrapping is also assumed to be negligible, because

demolition of container ships in the past 28 years is rather small (average 0.593% of total container capacity per year). Therefore, total new building is the dominate factor in the change of the world container carrying capacity.

New buildings in shipping industry are motivated by the profit that the existing shipowners can earn in the industry. To avoid complication, the research considers the industrial profit as a whole. It assumes that the new building orders are proportional to the industrial profit. An increase in industry profit can bring up the number of new orders, while a profit decrease would reduce the new orders. The factor that relates the total profit in the industry and the number of new orders in TEUs slots is defined as the propensity to invest in new capacity. Furthermore, the industrial profit is assumed to be determined mainly by the container freight rate, the demand for shipping service, the cost of operating and maintaining a TEU slot, and the bunker price.

One special nature in shipping industry is the time lag between the order of the new ship and its deployment in the world container fleet. This lag accelerates the change of freight rate in both the increasing and decreasing markets. In an increasing market when the demand increases faster than the capacity increase, the lag in shipbuilding prevents the increase of shipping capacity to match the speed of demand increase, although many shipowners are rushing to order more new ships. This can result in even higher increasing rate in shipping freight rate. One the other hand, when the market is just start to decrease, the new ships ordered in the previous years will keep delivering to the market. This will lead to faster increasing rate in building up capacity than that in demand. As a result, it will make the freight rate drop even faster.

Based on the above economic reasoning, a statistical model was regressed on the global shipping market data characterized by container throughput, container freight rate, world fleet capacity, and bunker price over from 1980 to 2008. The obtained model can largely replicates the dynamics of both the change of world container fleet and container freight rate in study period. The overall accuracy of the model is about 92%. To test the stability, the same model is fitted using data from 1980-2006, and used to predict the fleet capacities and freight rates in 2006 and 2007. The predicted values are compared with the actual capacity and freight rates published by Drewry. It shows the prediction errors is within 5%.

Using the data from 1980-2008, the contribution of significant factors to the market change can be summarized below. First, for investment in building new capacity, the estimated result shows that about 34 TEU slots will be added to the container carrying capacity, for every US$ 10 million profit in the industry. Secondly, in terms of cost, the average annual cost to own and operate a TEU slot is about US$ 19 thousand, whereas increasing one dollar bunker price will increase the container shipping cost by US$ 130 million. Thirdly, the estimated container slot reuse rate is about 42, which means that on average, one TEU slot can move 42 TEUs in one year. Finally, on the sensitivity of freight rate to the excessive demand/supply, the estimation shows that if demand increases 100 thousand TEUs more than the capacity increase, there will be an 89 cent increase in freight rate.

In predicting the future container shipping market, several assumptions have been made to approximate the future demand for container shipping service corresponding to different scenarios on the future world trade. Drewry predicted that the future demand growth rates would be 8.6%, 8.7%, 9.1%, 8.9% and 8.7% from 2009 to 2013. These estimates were made before the financial crisis. The paper assumed two different scenarios, 8% and 5% growth rate from 2009 to 2013, and also assumed possibility of cancellation of new orders (with different cancellation rate for orders made in different years).

From 2007 to 2008, the market freight rate already exhibits a decreasing trend. The prediction shows that the market will continue to decrease, with different decreasing rate corresponding to different assumption on the future demand, and will reach a turning point around 2011. Since

market is decreasing, option to cancel existing orders can help to curb the decreasing trend. If the increasing rate of the demand is around 8%, with 10% and 20% cancellation for the new orders made in 2007 and 2008 respectively, the freight rate can start to increase as earlier as 2010. However, with 5% increasing rate in the demand, the market would not begin to increase even with cancellation. Considering the impact of financial crisis, the future container growth rate may be lower than 5%. In this case, it is possible that the turning point may come even later than 2011.

In conclusion, the model can provide information for decision makers of both public policy and in private business. The maritime agencies or organizations at regional, national and international level can use this information to stabilize the market freight rate, so as to mitigate the negative impact of the recent financial crisis on the maritime industry, marine environment, maritime safety, and national, regional and local economies. In addition, bankers can use this information in ship financing decisions, to minimize the possible risks caused by the low freight rate. Finally, shipowners and ship operators can also use this method to setup their strategies to prevent or reduce possible losses in the coming years.

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