Column

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Commercial aspects of shipping

Market Dynamics

Part 2

(The views expressed here are solely those of the author, and do not necessarily reflect the views of the organization he represents.)

Continued from September issue, where we looked at theory of trade, absolute and comparative advantage theories, demand for shipping followed by actual supply, demand curves and resulting utilization. In this article, we will look at the demand and supply modeling followed by determination of equilibrium freight rates. The material used in this article is adapted from ICS Tutorship and those interested to learn more about the subject may consider pursuing the qualification examinations leading to Foundation Diploma and/or MICS (Member of Institute of Chartered Shipbrokers).

The bulk dry trade, from Handy to Capesize, is taken as an example. The analytical framework developed here can still be applied to other segments as well, provided that they satisfy the following assumptions (basically for a “close” to “perfect competition” scenario): -

1) Each shipowner company is seeking to maximise their profits, (or minimise their losses).

2) Each charterer is seeking the cheapest rate consistent with an acceptable quality of service offered by the shipowner.

3) There are a large number of fixtures (deals done), the details of most of which are readily available to all market participants (i.e. we have good information of the market transactions to guide us).

4) The model of perfect competition is assumed to be an appropriate framework for analysing market behaviour.

MODELLING DEMAND

The individual shipper’s firm requiring transport/ shipping services regards the freight rate as a given value which they cannot alter through their own individual action. It is assumed that there is a downward sloping relationship between the cargo volumes required to be moved and the level of freight rates, other things held equal. The higher the rate, the smaller the demand for cargo movements, and vice versa.

Will market demand be very responsive, or very unresponsive, to a change in the freight rate? Both are possible and consistent with a downward sloping relationship between rates and cargo quantities.

The demand for dry cargo tonne miles (multiplication of tones carried over a distance in nautical miles) is a *derived demand.*

The principal underlying the estimation of price elasticities for derived demands are:

1) The value of the own price elasticity of demand for the final good.
2) The existence of close substitutes
3) The proportion of the total final price which transport constitutes.

(for those who are inquisitive, you may refer to the subject of “elasticity” and “inelasticity” in a basic economics book or on the internet).

Take grain as an example. Grain movements are driven by production and consumption trends in different regions, by local weather conditions and crop yields, and by changing patterns of food consumption. Grain is itself an input; it is used to make bread or pasta, or fed to animals to produce meat. But bread, meat and pasta all *have low price elasticities* of demand. Most empirical evidence suggests that they are price inelastic.

Grain movements from major exporting regions such as North America have to go by sea. Air transport, whilst feasible for small volumes, is a very expensive alternative.

Historically, freight rates are about 5% of the final price of most traded commodities. The situation is different these days due to unprecedented high freight rates being witnessed and they may be much higher than 5% and in case of low price commodity such as cement, it could be more than the cost of product itself.

The conclusion is that, taken as a whole, market demand is likely to be extremely inelastic with respect to changes in freight rates. The demand curve can be represented as an almost vertical line, as in Figure 1 below.

Note that this conclusion is for *the market as a whole*. It does not follow that demand conditions on any one trade route are also necessarily inelastic. It could be the case that the possible sourcing of demand from other countries and other routes makes the demand on each route much more sensitive to changes in the specific route's freight rate; indeed, owners will always be seeking out trades/routes which are more profitable than others. But the ability to switch vessels' from one route to another at relatively short notice implies that rates should not get too out of line with each other (allowing for genuine differences in costs between routes of course); and indeed, the behaviour of individual freight rates suggests that this is indeed the case.

Figure 1 Inelastic Freight Demand Schedules

Freight rates are measured on the vertical axis and quantity of the commodity (or cargo tonne miles) are measured on the horizontal axis. D1, D2, and D3 show three different demand schedules, each further out to the right. These represent different volumes of demand, generated by higher and higher levels of economic activity, industrial production, or world trade volumes. A fall from D2 to D1 would represent a decline in tonne miles demanded, or cargo tonnes moved. A rise, or shift of the demand schedule from D2 to D3, would represent the long term expectation.

In some periods of the demand cycles, the demand schedule will be shifting rapidly out to the right, reflecting boom conditions (such as seen since 2003); in other years, it will be hardly shifting at all, and perhaps even declining.

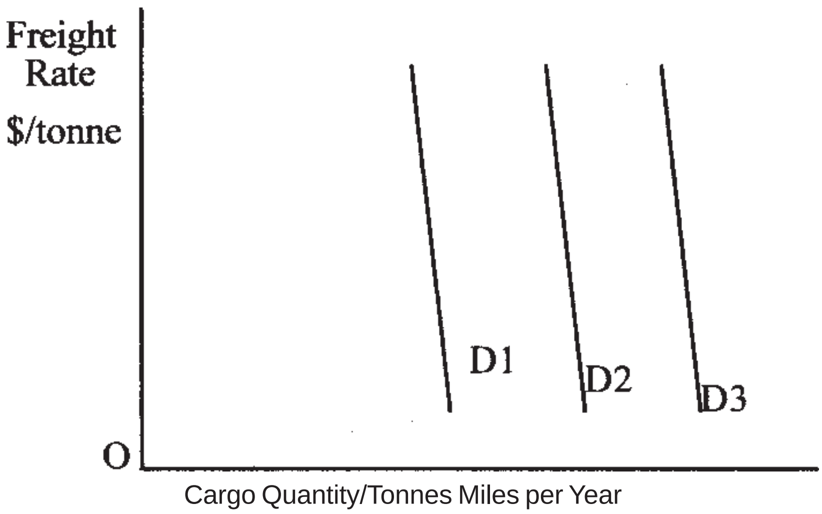
Over a long time period, it is anticipated that the trend will be a shift out to the right.

MODELLING SUPPLY

Under competitive conditions (and given a choice), theoretically the shipowner should never accept a freight rate that is less than the average variable cost of the ship's operation. Different ships have different costs, because either they are of different ages, or because they operate under different flags, or face different wage costs.

Imagine that all these costs were known, and that a ranking could be organised, starting with the dry cargo bulk vessel with the lowest average variable cost, moving up to the next, and so on until the last, most expensive vessel is brought in. If the freight rate were high enough, and cargo volumes large enough, all these vessels will be employed. Now imagine the freight rate or charter hire is steadily reduced. Which vessels will cease trading first?

The answer should be clear; those with the highest variable costs. As the rate is remorselessly lowered, more vessels are forced into idleness, until none are trading (close to 225 million deadweight of tonnage was laid up in early to mid eighties due to this reason. The author, as a third engineer, was looking after three laid up vessels off Trincomalee in 1984 along with a second officer and a cook). Furthermore, the capital costs should play no role in the lay-up decision in the short run, since these costs have to be met whether or not the vessel is being traded. Older vessels will tend to have higher operating costs than newer vessels, partly because they will be designed with older, less



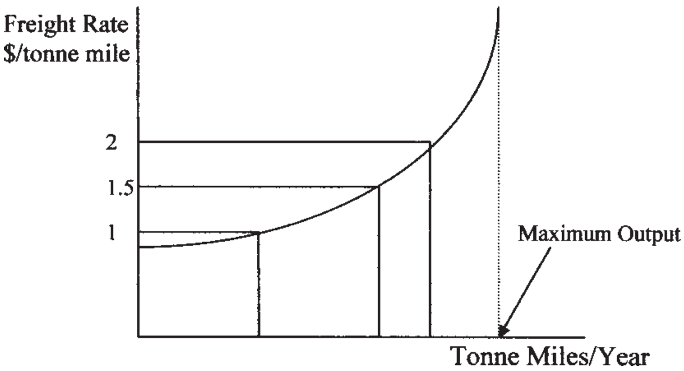
efficient equipment in place, partly because they will require greater crew numbers than modern ships, and partly because they may have older, more fuel inefficient engines. It is not surprising then, to observe that the majority of laid up vessels are the older ones of the fleets.

The shape of the supply schedule is drawn here for reference in figure 2. It is drawn so that it becomes steeper in slope as maximum tone mile production is attained. There are two reasons for this. Firstly, the additional tonne miles being created near 'full capacity' are being created by the more inefficient vessels in the fleet, the ones with higher variable costs. These vessels add a lot to costs without adding that much extra to output. Secondly, speed increases are a limited way of raising output. The extra costs of fuel consumption increase more rapidly than the extra output, so the required supply price increases.

The curve eventually becomes vertical, representing the notion of full capacity utilisation. *No more output can be obtained from the existing fleet, in the short term.*

In the language of economics, the supply curve represents the additional, or marginal costs, of meeting the extra output required. This proposition is only valid if the market is itself competitive.

Figure 2 Short Run Shipping Supply Curve

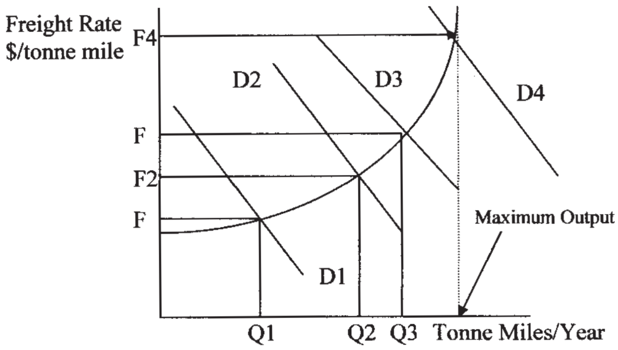


DETERMINING THE EQUILIBRIUM FREIGHT RATE

The market is defined as the interaction of supply and demand, which both together determine the equilibrium freight rate and quantities sold at that rate. Figure 3 below shows several different possible short run market equilibrium, each determined by different demand conditions.

The key factors that make demand conditions alter relate to the volume of world trade, which is driven by overall economic activity, and changing degrees of openness towards trade by individual nations. Demand curves further to the right represent larger trade volumes.

Figure 3 Short Run Market Interaction



Demand volumes increase from D1 to D4. Between D1 to D3 there is a relatively small rise in the market freight rate and a large rise in tonne miles produced. But between D3 and D4, the increase in demand is translated into large increases in rates, because supply becomes very inelastic, and the scope for increases in supply becomes increasingly limited.

The above model can be used to examine short run fluctuations in market conditions, but not long run ones. This is because the supply schedule represented in Figure 2 and 3 is drawn for a given stock of ships. It is a useful framework to explore fluctuations in freight rates in the short term however.

Consider the shift in demand from D3 to D4. Rates move up very sharply, and supply does not increase much. This creates large profits for existing shipowners, who will be encouraged to order new vessels. The value of existing vessels will also rise, reflecting the markets' expectation that profits are going to be healthy in the future. The increased number of orders will translate into a rightward shift in the supply curve in the long term, and this will lead, to a fall in rates if demand remains at D4.

On the other hand, a fall in demand from D2 to D1 means a fall in supply and a rise in vessel lay-ups. Remember that in the short run, some vessels will be trading at rates which do not cover their full costs. While this is acceptable in the short term, it is not the case in the longer term. Some vessels will be laid up, or scrapped. The scrapping of vessels leads to a leftwards shift of the supply curve. This process will help raise rates if the supply shifts far enough.

Continued in November issue of Sailor Today where we will review the effect of port congestion, scrapping and increased supply on the demand and supply models.

References: Tutorship Material, as necessary, adapted from the Tutorship Material with kind permission from Director General, ICS, UK for promoting Shipping Education and the Institute of Chartered Shipbrokers.

* The author has recently been admitted as a Fellow of the "Royal Institution of Naval Architects", UK and an Associate of the "Chartered Institute of Arbitrators", UK.