Obtaining Forecasting Capability by Examining Equity Valuation Models: A Case of Taiwan’s Sea Cargo Industry

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ABSTRACT

This paper makes use of various valuation models to evaluate the intrinsic value of companies in Taiwan’s sea cargo industry. The results indicate that the Edwards-Bell-Ohlson (EBO) model is the best model available for valuation in terms of forecasting capability.

INTRODUCTION

Recently the business within Asia is expected to be expanded rapidly because the direct ship routes between Taiwan, Hong Kong and China is going to be connected. Due to a significantly growth in the national trade, there have been rapidly increasing demands for the services of transportation and Sea Cargo industry in Taiwan. Currently, Taiwan have more concerned about how to spend the geographic location efficiently. Figure 1 and 2 indicate that Taiwan’s Sea Cargo industry has a large transportation size and enterprisers are very willing to spend large investment to obtain transportation services in order to increase the level of Sea Cargo. This leads to the fact that Sea Cargo-related industries are regarded as promising new industries and valuable investment opportunities for investors in Taiwan.

However, Transportation Research Board (1999) states that the Sea Cargo industry has the following industrial characteristics: (1) Risky: Marine transportation industry needs a lot of investment such as building the ships, the standard TEU, and the frame of container car. However, the long payback period, the low rate of return and the increasing operation costs cause financial distress, (2)Float with global economy: marine transportation industry strongly relates to the outcomes of manufacturing industry which is influenced by global economy. Therefore, sea cargo business will go after the trend of global economy. (3)Unstable income: Because the cargos’ categories are multitudinous and the measurements of the freight are different, the voyage income will be unstable. (4)Small elasticity of supply: The scales of sea cargo enterprises are difficult to expand due to the time needed and the costs. Therefore, the supplies need much longer time to adjust with the market situation. (5)The price of fuel, exchange rate and other costs influence profits seriously: The cost structure of the sea cargo business is approximately divided into few categories: depreciation (24~25%); fuel (10~12%) which change with oil price fluctuation; storage, handling and shipping (14~15%) such as remittance charge, commission, handling charge, etc.; transportation charges (50~51%) such as freight, loading and unloading expense, harbor terminal expense, etc.; others (1~2%). Shipping merchants’ income generally is calculated in US dollar or other currencies, but expense mostly is calculated in local currency. Therefore, the price of fuel, exchange rate and some other costs influence profits seriously. (6) Government policies affect the business deeply: Government policies are concerned with the international trade and national defense. In order to avoid threaten of national security, most of the governments set barriers against other countries. (7) Transportation charges are difficult to rise due to the development of ultra and large-scale vessels: In order to reduce the unit...
transportation cost, not only the ships become larger and larger but also the competitions become more intensive. If demand of the business didn’t increase, the freight will be difficult to raise either. (8) The international standard norm and national regulation have to be observed: The cabinet shipping industry is intercontinental. Therefore, various harbors rules and regulations must be obeyed in order to obtain the certificates of seaworthiness and insurance policy. (9) Disequilibrium of the empty container dispatch: The cargos’ categories and the weights are different, so the market in this industry is extremely balanced. The unidirectional spatial cabinet could not be dispatched easily and the revenue is corroded.

Obviously, finding the available valuation models that stock market analysts use to uncover mispriced securities is an ongoing concern. In this paper, we will use the equity valuation models presented in Reilly and Norton (2006), Bodie, Kane, and Marcus (2005), and Damodaran (1996) to analyze the investment value of firms in the sea cargo industry of Taiwan. Therefore, the purpose of this paper is to find which is the best valuation model in terms of forecasting capability. We use Theil’s U value to represent/measure forecasting capability. The evaluation model with best forecasting capability is the model that can be used to increase and protect the investors’ investment value.

Figure 1. yearly growth in deadweight ton (%) 

Figure 2. Forecasts growth in deadweight ton
The paper is organized as follows. Section 2 contains a brief description of related literature. Section 3 presents and discusses the evaluation models used in the present paper. In Section 4, we state the results obtained [in the paper]. Section 5 concludes the study.

LITERATURE REVIEW

After reviewing the literature relating Taiwan’s sea cargo industry, we find that it is difficult to get literature focusing on the evaluation of sea cargo business. In fact, we noticed the fact that the previous studies of sea cargo business have mostly focused on performance assessment and statistical analysis. The financial indicators usually applied are those based on the discounted value model or the relative value model. When determining the value of different industries, the price/book value ratio method is the most popular method. And most of the related literature that is about satisfaction analysis use analysis of variance, correlation analysis, and regression analysis. We select two papers to represent the above argument as follows.

Cheng-Lung Chen (2000) studies the financial assessments are usually adopted in traditional studies of the performances of shipping companies, which fails to establish a single aggregate measure and lacks information about improving performances. The present study applies DEA (Data Envelopment Analysis) method to evaluate the performance index of cost effectiveness in operating efficiency of liner shipping companies in Taiwan. These DEA models basing on the data of 1994-1998 provide CCR efficiency, A&P efficiency, cross efficiency, and multi-objective efficiency. Furthermore, CCR efficiency is divided into pure technical efficiency (BCC efficiency) and scale efficiency. Besides the comparison of these efficiencies and the discussion about related content, the present study also performs scale analysis, multiplier analysis, slack analysis, and sensitivity analysis. Finally, the comparison of profitability and operating efficiency is conducted. Mei-Chun Huang (1998) seeks to evaluate the factors affecting the pure risk management in liner shipping. A structural equation modeling (SEM) approach was used to test the effects of the levels of executive’s support, organizational formalization and information system on the performance of pure risk management. The results indicated that container carriers generally perceived the importance of risk management. The degree of executive’s support, organizational formalization and information system was found positively related to the performance of pure risk management. Some implications for theory and practice are briefly discussed in this study.

METHODOLOGY

This study interviews 2 companies, which are undertakings in the sea cargo business, as study objects. The financial reporting data and related information will refer to the InfoTimes database and Taiwan Economic Journal (TEJ) database and the public data of the Taiwan stock exchange market. We use the following 5 enterprise evaluation models to assess the companies’ intrinsic value and the brief description of empirical research models is as follows.

1. Price/Earnings Per Share Ratio (P/E model)
   P/E model is the ratio of stock price to per share earnings after taxes (market price/earnings per share). The most important factors of the PE model include dividend payout ratio, Hurdle rate, and earning growth rate. The PE model predicts the earning of per share and then determines the share price of the company. This ratio is a common market multiplier applied by the majority investors. The P/E model clearly shows the relation between share price and earnings. It is not easy to calculate but can easily be accessed when the required data is available.

2. Price/Book Value Ratio (P/B model)
   P/B model is the ratio of share price to per share book value. (Per share market price/per share net value) The important factors include rate of return on equity, dividend payout ratio, Hurdle rate, and earnings growth rate. It is as
P/E model to multiply the appropriate price/book value ratio with predicted net value per share. [I don’t understand what the previous sentence is meant to say: please email me more information through the Edit Avenue system so that I can suggest improved wording]. By using the P/E model, we can obtain the share price.

3. **Price/Sales Ratio (P/S model)**

P/S model is the ratio of share price to the sales per share. (Per share price/per share sales). The important factors include net rate of interest, rate of dividend payment per share, rate of essential rewards and expected rate of profit growth. Like P/E and P/B models, the P/S model is one of the common methods for evaluating the intrinsic value of a company. This model is of a similar type as the P/E model in that the company stock value is multiplied with sales volume.

4. **European Style Option model (Black-Scholes model)**

Investor’s Equity value can be viewed as a call option. The value of a company is taken as object. The executed duration is until debt is coming due. The executed price is the debt price. During the period of time for execution, if the company’s value is higher than its debt value, investors will be willing to execute the contract. They will pay for both principal and interest on debt. The residual value, which is the company’s value from which the debt value is subtracted, is the equity value of investors. If the value of the company is less than the value of debt, investors will give up the option and then the company will liquidate the debt. Therefore, investors will not obtain any profit. The formula is as follows.

\[
C = S N(d_1) - X e^{-rt} N(d_2) \tag{1}
\]

\[
d_1 = \frac{\ln(S/X) + rt \times t}{\sigma \sqrt{t}} + \frac{\sigma \sqrt{t}}{2}, \quad d_2 = d_1 - \sigma \sqrt{t}
\]

- \( C \): forecast stock price
- \( S \): book value per share
- \( X e^{-rt} \): discounted debt value (book value)
- \( N(*) \): accumulated normal distribution value
- \( \sigma \): standard deviation of investment reward
- \( r \): risk-free interest rate
- \( t \): the debt expiration date

5. **Edwards-Bell-Ohlson model (EBO model)**

Edwards-Bell-Ohlson (1990, 1991, 1995, EBO) model is viewed as the evaluation model of discounted residual value. This type of evaluation model was derived during the 1930s and has been in use since: it is applied in accounting, financial, and economic fields. It is very common to apply the dividend discount model in estimating the intrinsic value of a company. In other words, it is the summation of the discounted future cash flows. Assuming that cash flow will occur during each period of time in the future, it is also called the share of that period of time. In order to obtain the intrinsic value of the company, the following data are necessary: equity cost, return on equity (ROE), and future book value.

Among all factors, the equity cost comes from CAPM. The prediction of future return on equity (ROE) is the most challenging and significant part of EBO model. This study will use EPS, as predicted by an analyst, to calculate the future ROE. The future book value B(t+1) will be obtained by this all-inclusive concept. The formula is as shown in (2).
\[ B_{t+1} = B_t + N_{t_{i+1}} - D_{t_{i+1}} = B_t + (1 - K) N_{t_{i+1}} = B_t + [1 + (1 - K) ROE_{t+1}] \] (2)

Equation (2) can also be used to calculate the book value \( B_{t+1} \) in other period in the future, where \( K \) is the dividend payout ratio.

**RESULTS**

We employ 5 different methods to evaluate the intrinsic value of a sea cargo business to find the best-fit evaluation method for sea cargo business. Furthermore, we compare the differences of each evaluation model with respect to forecasting capability. In this paper, we use Theil’s U value as the indicator of forecasting capability to find out which evaluation model has the best capability for predicting the stock price of the company in the sea cargo industry. The smaller Theil’s U value, the better its prediction capability is. When Theil’s U value is zero it means that the predicted value is equal to the real value. Therefore, it is better for Theil’s U value to be close to zero. By applying/using the above 5 models to calculate the intrinsic value of the company and then to compare it with the market share price, we find that the EBO model is the most appropriate model for the sea cargo business evaluation in terms of its forecasting capability. P/B model and Black-Scholes model are the second and third most appropriate models respectively, for evaluating the sea cargo business in terms of forecasting capability.

<table>
<thead>
<tr>
<th>Forecast price</th>
<th>PE method</th>
<th>PB method</th>
<th>PS method</th>
<th>Black-Scholes</th>
<th>EBO method</th>
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<tr>
<td>Theil’s U ratio</td>
<td>0.539995</td>
<td>0.693694</td>
<td>0.892875</td>
<td>0.445359</td>
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<td>Rank</td>
<td>3</td>
<td>4</td>
<td>5</td>
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</table>

**CONCLUDING REMARKS**

Our study is based on the general enterprise evaluation framework. We make use of 5 different methods to calculate the intrinsic value of sea cargo business in Taiwan. We find that EBO model is the best model to evaluate the sea cargo business in terms of forecasting capability. The following points are our major reflections:

1. The primary effect on Price/Book Value Ratio is the book value of each stock share. The higher the ratio of book value of each stock share, the higher the value of the company’s share. We know from the data that a low book value comes from the decline of overall operational environment, which in turn causes the profit to fall.
2. In the option-pricing model, the real value is affected by the investment reward rate, the risk-free interest rate, debt, average share numbers, and expiration date. The option contract can be redeemed at any time during which it is listed on a common stock market. This is due to the characteristics of high liquidity and easy recapitalization of the option.
3. It is necessary to estimate the average market return on an investment, average company return on investment and the systematic venture capital investments of the company while applying the EBO model. However, since the period under study is not long enough it may affect the accuracy of result. There is some modulation of growing rate prediction. The analyst utilizes the predicted EPS, which was applied during sampling to infer the EPS growth rate for each sampled company. The future prediction in the following time-period is based upon the EPS growth rate. It may reflect accidental situations. Besides, if the trend of EPS growth rate holds, it will influence the book value in
each year and also the return on equity (ROE). Furthermore, it will also influence the final result of trial balance/balance sheet.

REFERENCES


Institute of Shipping Economics and Logistics (ISL), http://www.isl.org/.


