Assessment of Operating Leverage in the Mechanical Engineering Industry

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Abstract—The aim of this work is finding the relation between operating leverage, profit, and revenue through sample-based estimation of DOL (degree of operating leverage) for the mechanical engineering industry of Russia. The estimation will be done by a regression model includes annually data extending from 2007 to 2011.

I. INTRODUCTION

Operating leverage is a term which is reliance on various financial factors of a company like revenues, operating income (EBIT) and fixed costs. It is one of the determinants of multiplier (price/carrying amount). DOL typically presents the extent to which operating profits of a company change as sales changes [2]. So through this degree, investors and even the company’s managers can estimate and predict the profitability of the company under specific circumstances. Generally speaking, a company with a high degree of operational leverage has an adverse condition in different risks and vice versa, the lower the DOL, the lower the potential threat from predictable risks in future. According to Sheena (2011), firms having high DOL are prone to large fluctuations in their operating profits any time sales levels fluctuate [3].

In the business valuation it is important to consider the methods, which based on the principle of maximizing total fund of company or market value of ordinary shares. It illustrates the company situation, definitely its risk profile and its future profitability. Furthermore, it is a crucial indicator for the investors who want to buy and invest in company stock. However they consider the computation of operating leverage which is called DOL (Degree of Operating Leverage).

We can mention that a logical and rational investment decision takes into account different indicators representing the economic-financial position of the company, which supports the making of predictions on the company’s future feasibility. Among these indicators, we can persist on the DOL as a relevant one.

II. PROBLEM STATEMENT

The calculation of operating leverage has been a technical problem those plaques the researchers in this category of studies [1]. Furthermore this indicator always is calculated annually and rarely researches debate on its time path. It would be useful for both of investors and managers to know the time path of DOL. Especially in the mechanical engineering industry of Russia which is one of most important industries in gross domestic products and also foreign trade. Due to this fact, investment (local and FDI) would be so sensitive to the profitability of this industry. Nevertheless, the computation of DOL basically in to the time series trend is a great indicator to estimate sensitivity. So, all in all, we prove this problem in our research and try to solve the problem mathematically and empirically in the mechanical engineering industry.

III. METHODOLOGY

This section describes the methods used in this study, involving sample selection and data collection. In this research, we are trying to present a new adoptable regression model to analyze financial data and find DOL and more, the relations between this degree and the revenues and operating income of our nominated companies. Here, we are investigating sample of Russian mechanical engineering companies, which have the financial statements under IFRS structure, and also their shares are traded on the RTS stock exchange. In addition financial mediators were excluded (banks and financial institutions) to satisfy the homogeneity of datasets.

As we mentioned before, in this study, mechanical engineering industry has been considered. So we have used the annual financial statements of them to collect data during 2007–2011. In this direction, we have used factors such as revenue (explanatory variable in our regression model) and operating profit (dependent variable in our regression model). The primary information about market capitalization of the companies we have considered, obtained from the website of the RTS stock exchange (www.rts.ru).

It was recorded to all industries- We divided all data on the minimum value of the sample, if it was necessary, we made shift to exclude negative values and at the end all dataset were carried out on the logarithmic scale.

We have also developed the program for processing the samples in MATLAB.

IV. CLUSTER ANALYSIS

We have used hierarchical cluster analysis. If variables are quantitative then the distance between the objects can be calculated e.g. as the Euclidean distance [4]. With using the Euclidean distance and the Single Linkage method (Nearest Neighbor), the dendrogram in “Fig. 1” and “Fig. 2” is obtained.

The dendrogram is a visual representation of the spot correlation data. The height of the branch points indicates how similar or different they are from each other: the greater the height, the greater the difference. The Single Linkage distance between two clusters is defined as the distance between the nearest pair of objects in the two clusters.

We have defined clusters within each indicator. We have found no statistically correlation in either the two indicators and so we take each of characteristic as representing single
vector and then we could focus on finding a relationship between these two indicators.

\[ X_t = A + D \times \ln S_t + \varepsilon(\mu, \sigma) \]  

\( X_t \) – Operating profit at time \( t \);
\( S_t \) – Revenue in period \( t \);
\( D \) – Regression coefficient representing the degree of operating leverage (DOL);
\( A \) – Regression coefficient;
\( \varepsilon(\mu, \sigma) \) – Random error.

So we have obtained the following dependencies which are shown in Table I.

<table>
<thead>
<tr>
<th>Analysis</th>
<th>regression equations</th>
<th>degree of operating leverage, ( \text{DOL}^* )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Results of correlation analysis</td>
<td>( \ln x = 7.1498 + 0.7976 \ln S )</td>
<td>0.7976</td>
</tr>
<tr>
<td>Simulation results: ( \varepsilon(\mu=0, \sigma=3) )</td>
<td>( \ln x = 7.0966 + 0.9888 \ln S )</td>
<td>0.9888</td>
</tr>
</tbody>
</table>

\( \text{DOL}^* \) - Factor of the second term in the regression equation refer to "(1)".

VI. RESULTS AND CONCLUSIONS

We have found evidence of a high positive relationship between revenues and operating income. The result of simulation shows the degree of operating leverage is 0.9888. By given values the mathematical expectation (\( \mu=0 \)) and standard deviation (\( \sigma=3 \)) in "(1)", we accounted random error (\( \varepsilon(\mu, \sigma) \)). According to this parameter, DOL equal 0.9888 and as a results degree of operating leverage approach to real.

REFERENCES