

BENCHMARKING SHIPPING COSTS USING REGRESSION AND DATA ENVELOPMENT ANALYSIS

*Seong-Jong Joo, College of Business, Central Washington University-Des Moines, 2400 S 240 St,
Des Moines, WA 98198, 206-439-3846, joos@cwu.edu*

*Carlo Smith, College of Business, Central Washington University-Des Moines, 2400 S 240 St,
Des Moines, WA 98198, 206-439-3854, csmith@cwu.edu*

ABSTRACT

Since deregulation in the 1980s and 1990s, the U.S. transportation industry has become more and more competitive within and across modes. The trucking sector has been especially competitive due to a densely populated and highly fragmented market structure. The competitive situation has resulted in a motor carrier industry with a cost/performance profile resembling that of more commodity-based products and services.

Shipping companies have generally benefited from the competition. However, smaller differences in cost, service quality and delivery performance among motor carrier services providers is requiring new methods to identify the best possible options to handle freight.

The purpose of this study is to evaluate a multi-method approach to carrier benchmarking that may be used evaluate the cost/performance tradeoffs among carriers while considering trends in market costs. Specifically, we employ ordinary-least square regression along with data envelopment analysis to evaluate carrier transportation cost samples separately and jointly. The contributions of this study include a proposed framework for benchmarking shipping costs along with managerial insights that the analysis reveals.

Regression analysis employing an ordinary-least square method can estimate a line that minimizes errors around the line that is similar to a mean trend. This property is good for understanding a market trend for analyzing shipping costs. That is, shipping managers can understand whether they are paying higher than the market average or less than the average. Regression analysis also allows the managers to construct a confidence interval that shows a range of a shipping cost. More importantly, regression analysis can be used for predicting a shipping cost using pertinent variables. Other important properties of regression analysis include testing hypotheses and generalizing findings. Thus, regression analysis, used properly, can provide great benefits to the shipping managers.

Data envelopment analysis (DEA) is based on a production theory and solved using linear programming. DEA finds frontiers or best performers in a production possibility set. DEA measures the relative performance of entities and, thus, can be used for benchmarking purposes. DEA is also able to suggest potential improvements on variables such as reduction on inputs and/or increase on outputs. Unlike ordinary-least square regression, DEA can include multiple outputs that are similar to dependent variables for regression models. However, since DEA measures relative performance and lacks robustness that is related to the consistency of results by adding and/or deleting observations, it is difficult to generalize findings.

We use regression and DEA independently and jointly for analyzing shipping costs and demonstrate a framework with a case. We have obtained data from a supply chain consulting firm that has partnership with multiple shipping companies. At the time of our study, we failed to find similar studies. We discuss findings and managerial insights for shipping companies and conclude our study.