Forecasting short term trucking rates

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Motivation / Background

Transportation
• $1.5 trillion spent in 2015 on logistics and transportation
• 8% of US GDP
• Up to 50% of total logistics costs are transportation cost
• Emphasize on lean production and inventory minimization

Trucking
• Lifeblood of the US economy
• Earned $726.4 billion revenue in 2015
• Represents 81.5% of US freight transportation revenue
• Transportation budget planning
• Economics order quantity
• Inventory replenishment
• Facility location

Forecasting

Key Question / Hypothesis

The objective of this project is to develop a forecasting model that predicts both contract and spot rates for dry van on individual lanes for the next seven days on a rolling-window basis.

Relevant Literature

Approximated rate functions
– Freight rate defined as a function of distance and weight. By using such function, a simple market rate for a lane can be calculated for a given origin and destination (Swenseth and Godfrey, 1996)

Actual rate forecasting
– Budak et al. (2017) compared artificial neural network (ANN) and quantile regression methods in predicting TL spot market price.
– Özkaya et al. (2010) used multiple regressions to model the US Less-than-Truckload (LTL) market rate. Considered both tangible and intangible market (not captured in the dataset) factors.

Methodology

Input

Model training & testing

Artificial Neural Network

Output

Expected Contribution

• Improve short-term forecasting accuracy of TL rate;
• Identify the spot and contract rate relationship and how past values of spot can be used to predict contract rate;
• Identify effects of market variables, such as weather condition on TL rate;
• Aid decision-making processes for truck carriers with respect to determining future cash flows.
• Provides useful guidance for third-party providers and shippers regarding potential price fluctuations and resulting risks.

Initial Results

RMSE for in-sample data

MAPE over time (weekly update four weeks forecast)

RMSE for out-of-sample test

Actual vs forecasted rate