

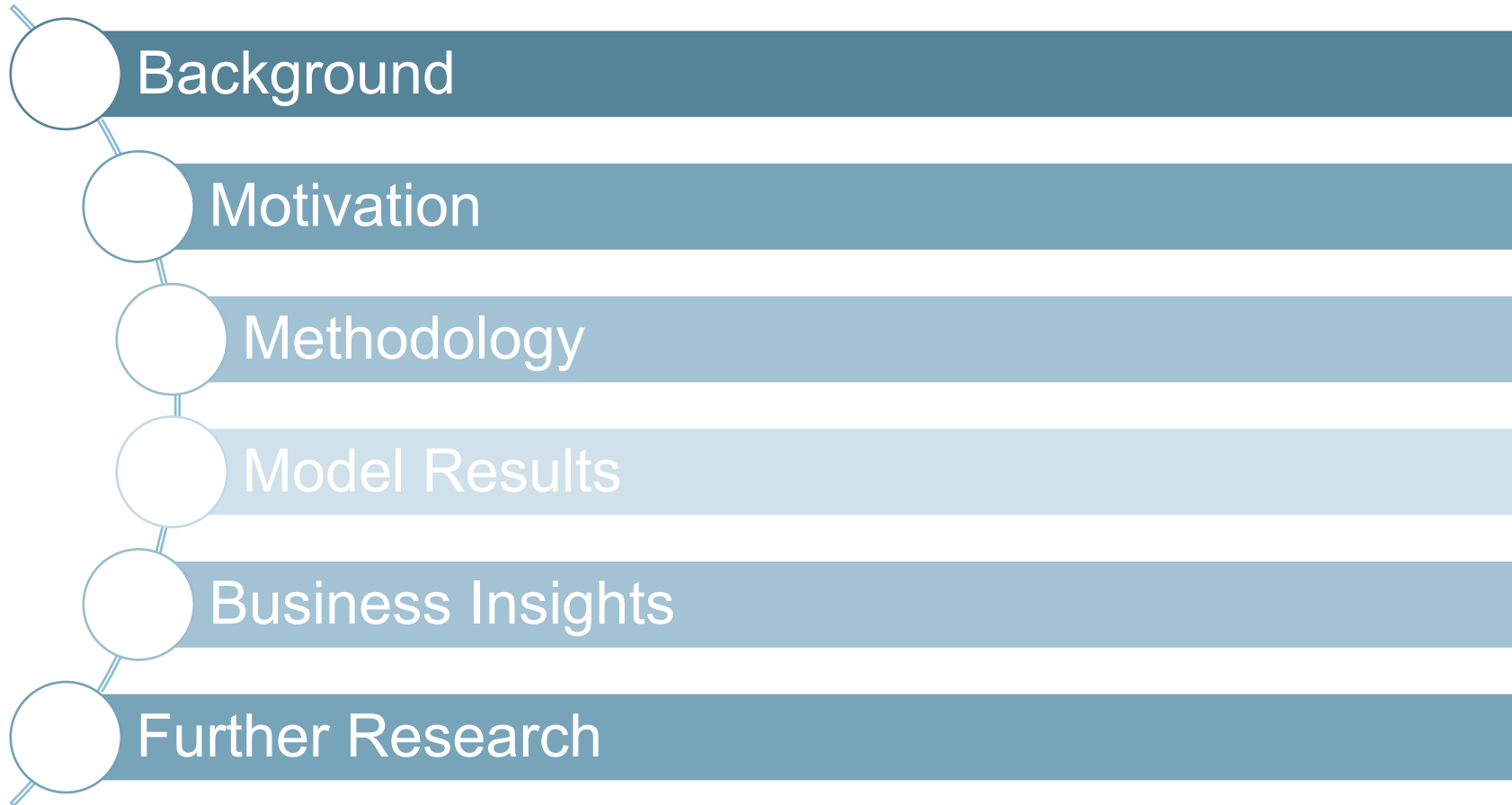
Root Cause Analysis and Exploration of Unplanned Costs in Truckload Transportation

Capstone Advisor : Dr. Chris Caplice

Capstone Partner: C.H.Robinson

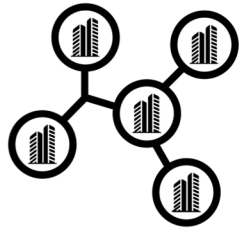
Team members: Nishitha Aemireddy, Xiyang Yuan



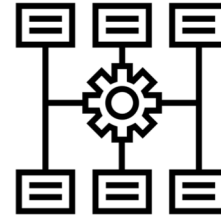


Background – TMC

TMC is a division of C.H. Robinson that offers Managed TMS®, a unique combination of global transportation management system (TMS) software, logistics process management, and consulting services.



Operated as an **independent** division of C.H.Robinson since 1999



Offers managed TMS®



Operates from **5** different locations across globe



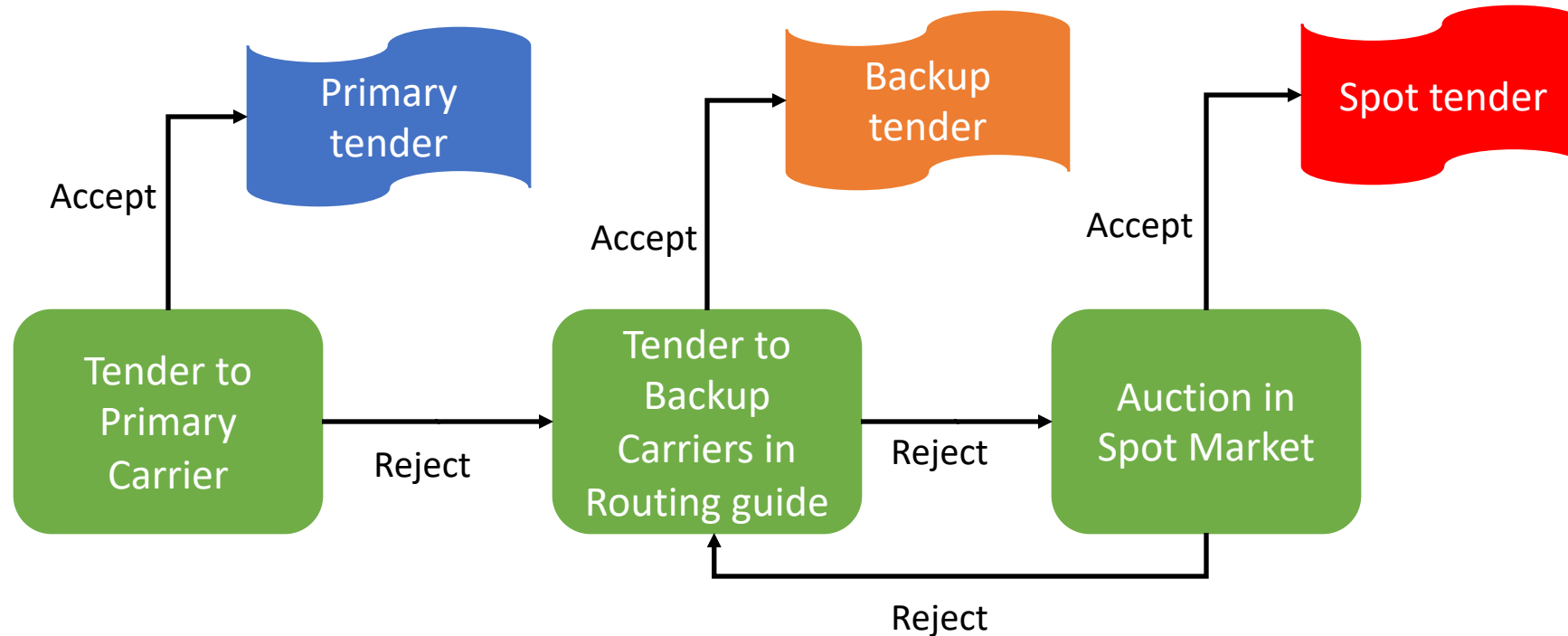
10.4 Million shipments



\$3.1b in Freight under management

Background – Load Tendering Process

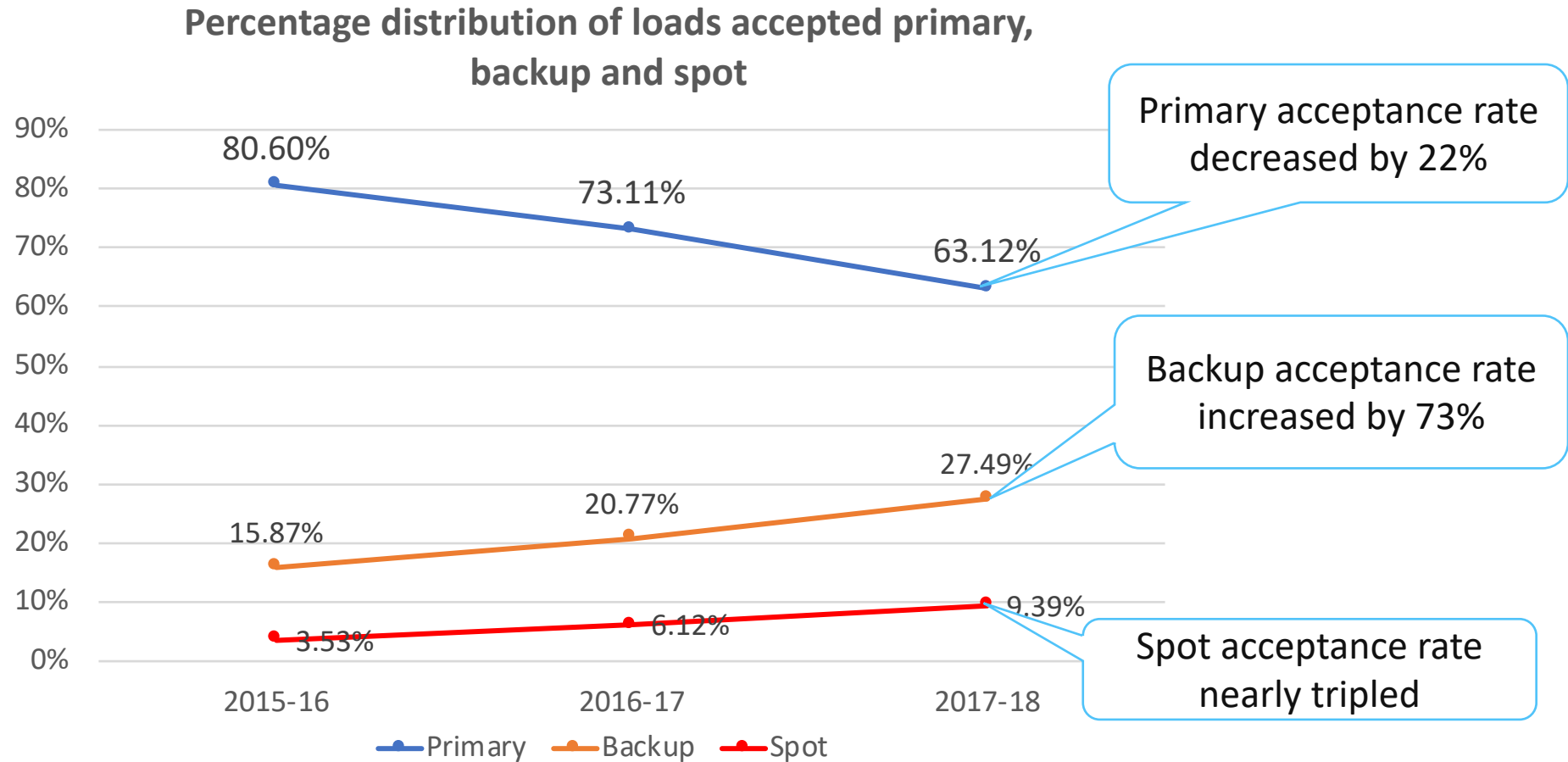
TMC uses routing guides for their load tendering. Loads are tendered in sequential order where the sequence of carriers is determined based on prices, performance levels and capacities.



Motivation

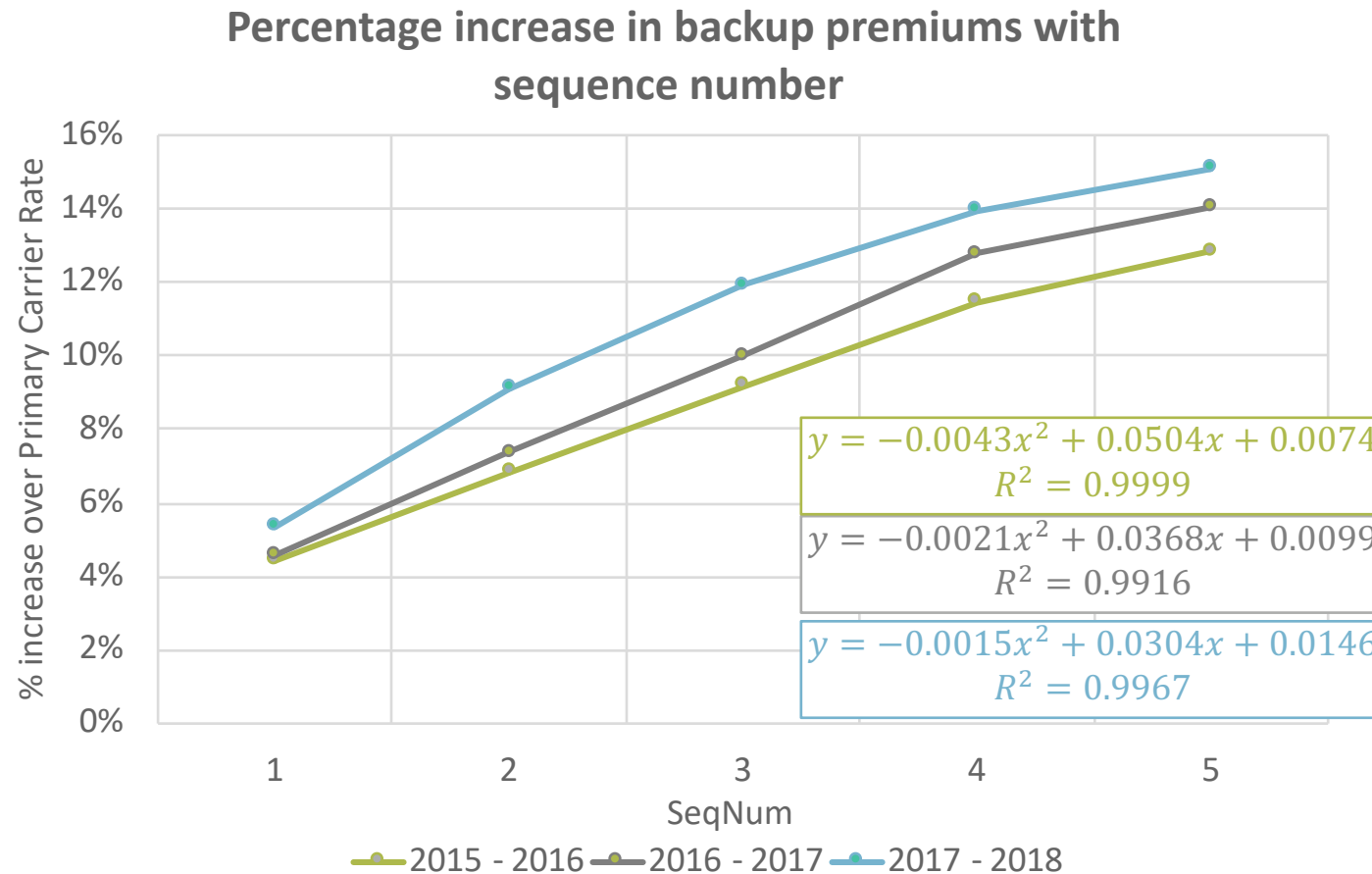
Tender rejections by primary carrier increased from 19% in 2015-16 to 37% in 2017-18.

2015-16 is a soft market, 2016-17 is a transitional market and 2017-18 is a tight market



Increase in premiums with Routing guide depth

Backup premium : Average of percentage difference in backup carrier rates in routing guide and primary carrier rate over all lanes

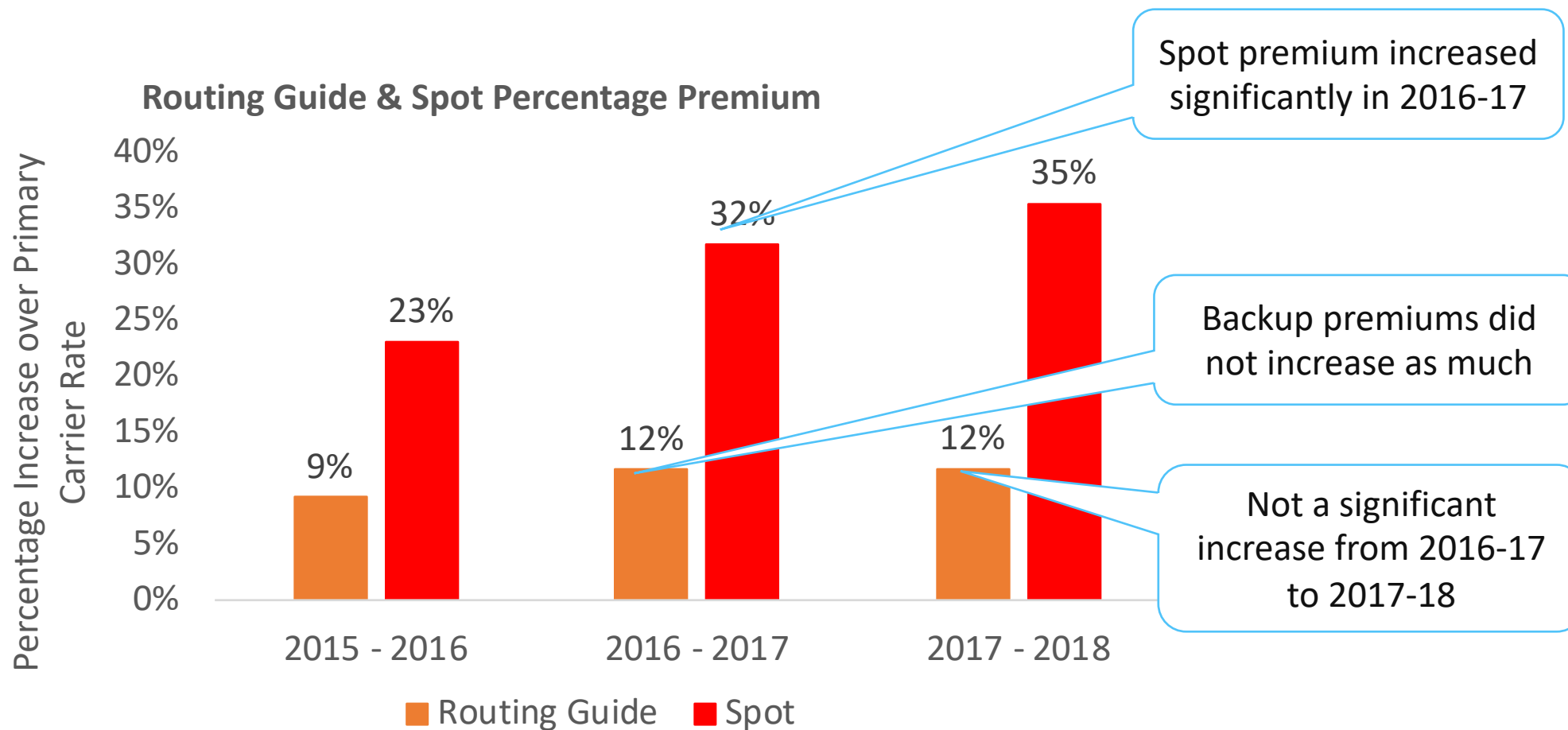


Premiums paid increased from 2015 to 2018

Premiums increased at a decreasing rate with sequence number

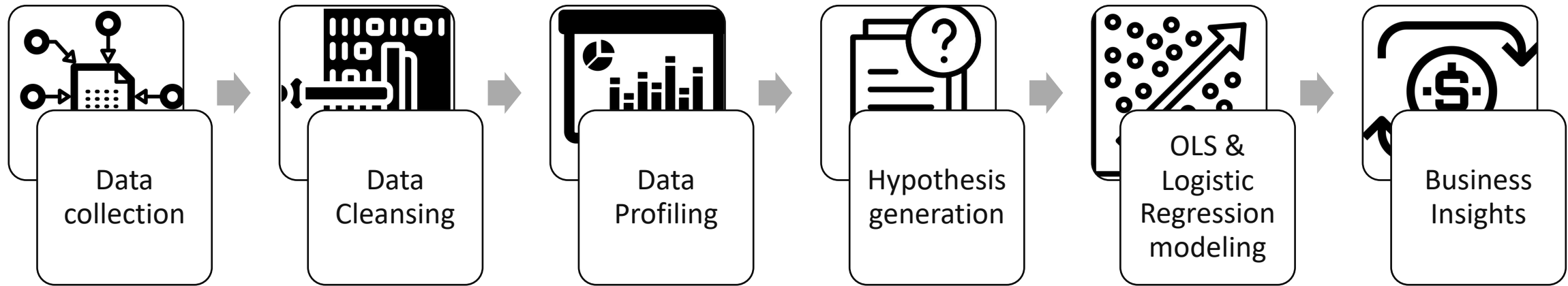
Routing guide and Spot pricing premiums

Spot premium : Average of percentage difference in spot rate and primary carrier rate over all lanes



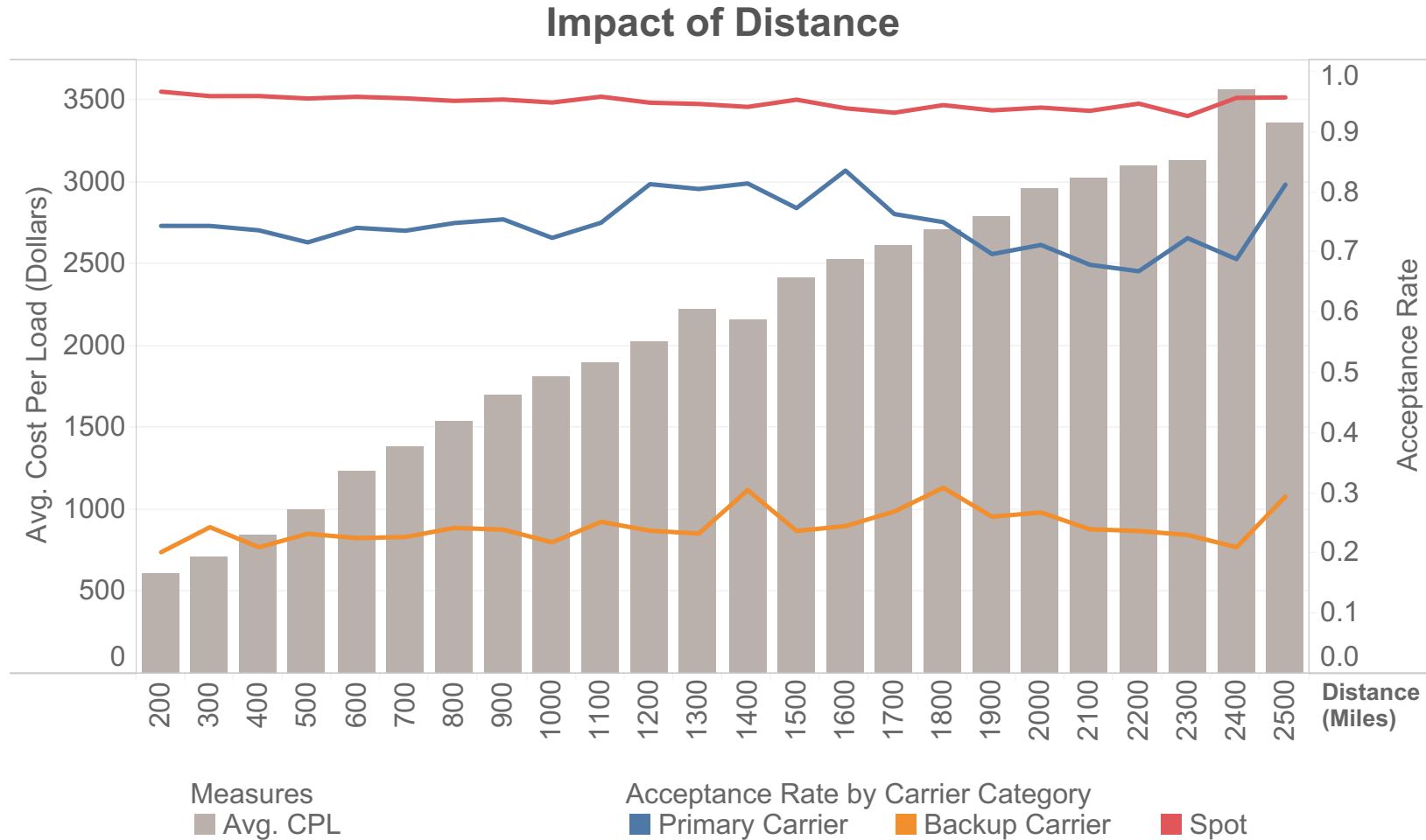
Methodology

The project uses 3 years of load and tender data from October 2015 to September 2018. The dataset contains only full truckload (TL) dry van shipments with a minimum length of haul of 250 miles



Data Modeling Results - Distance

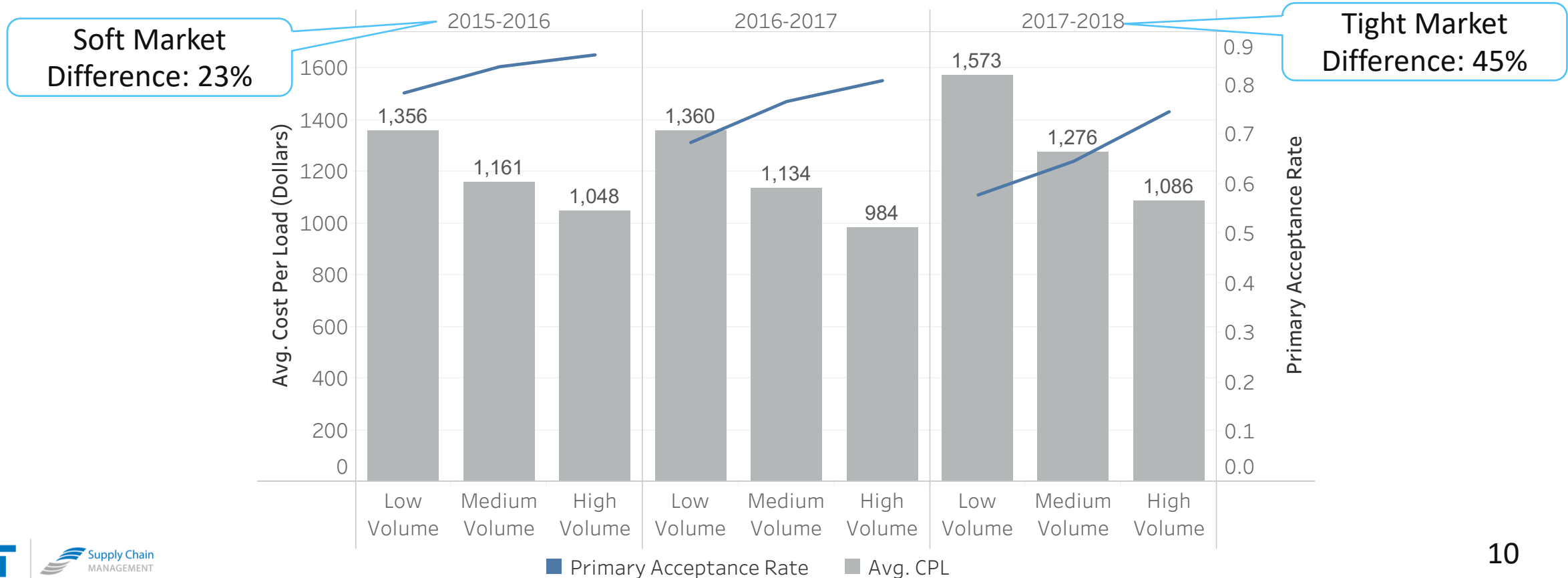
- *Longer the distance, higher the cost.*
- *Distance has no clear impact on tender acceptance rates.*



Data Modeling Results – Corridor Volume

- Corridor volume: Monthly average volume for each 3-digit to 3-digit zip code combination.
- Higher the corridor volume, lower the cost per load.
- Increasing corridor volume increases primary carrier acceptance rate and reduces the chance of going to spot market.

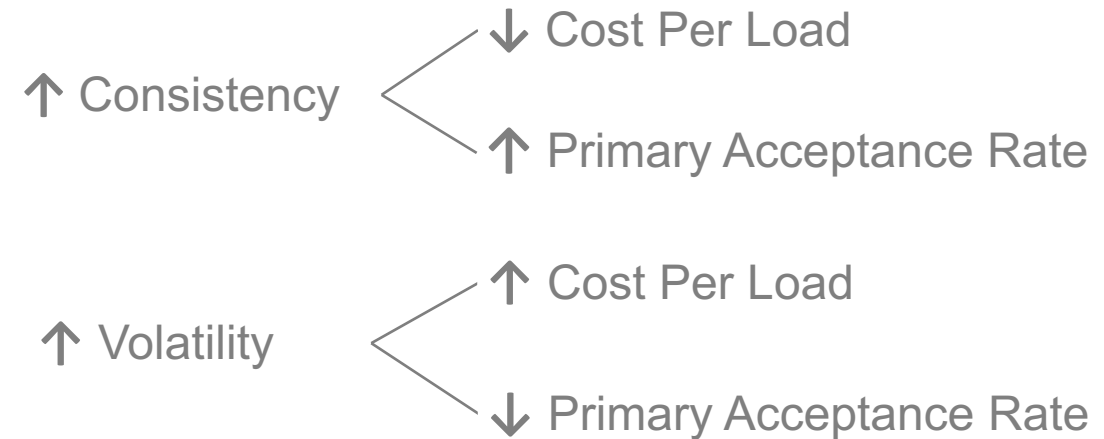
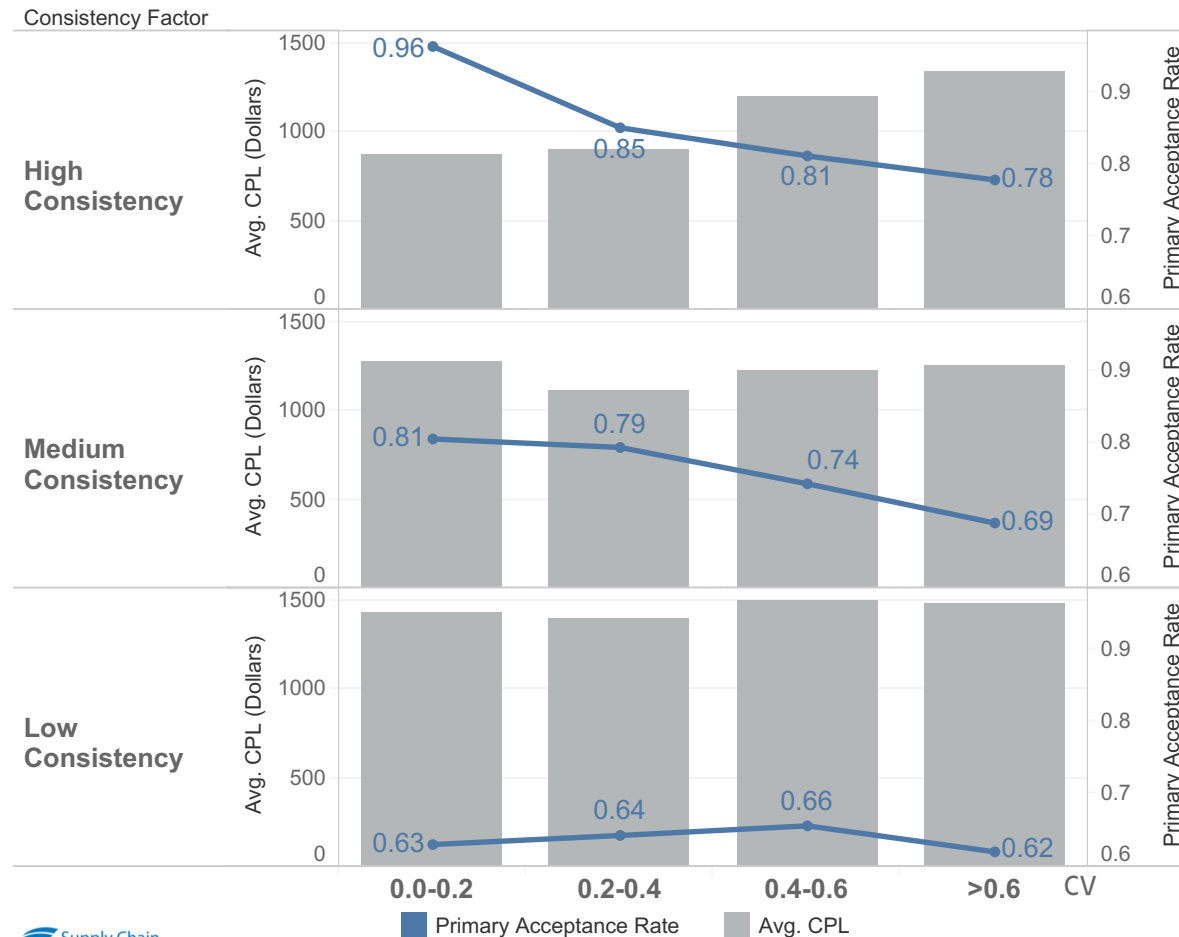
Impact of Corridor Volume



Data Modeling Results – Lane Consistency & Volatility

- *Lane Consistency: Number of weeks that a lane has at least one load in a year*
- *Lane Volatility: Coefficient of Variation (CV) of the weekly volume on a lane when volume is present*

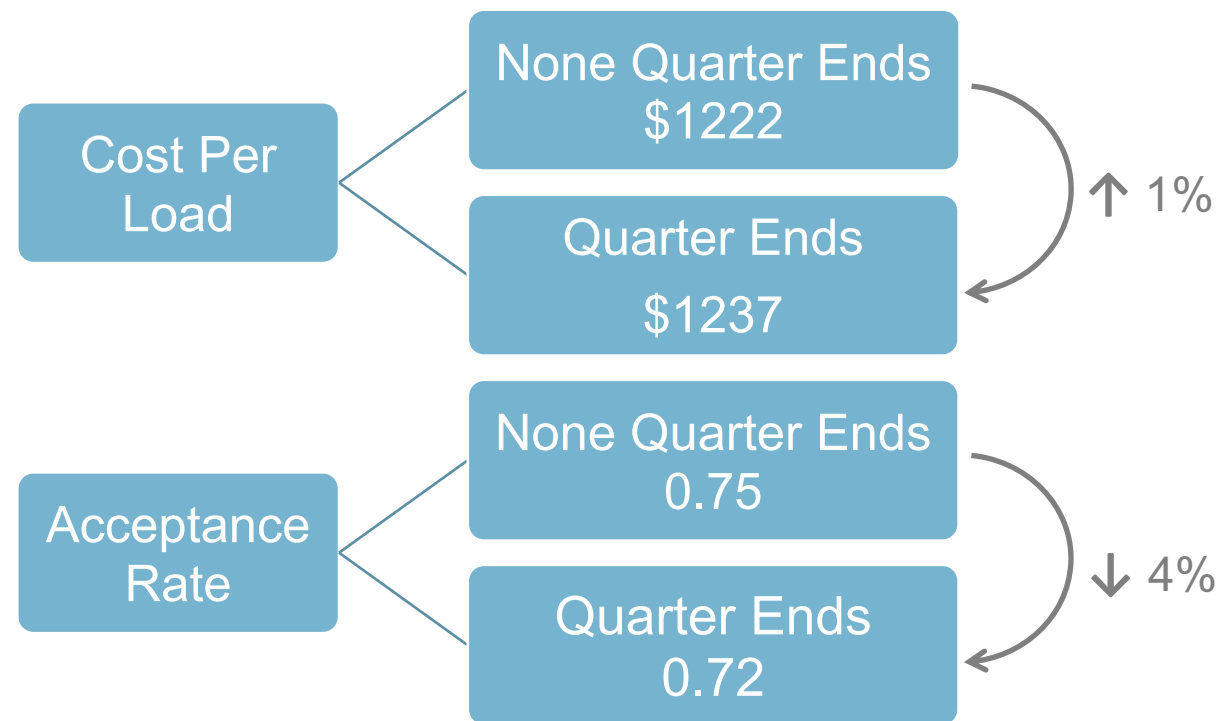
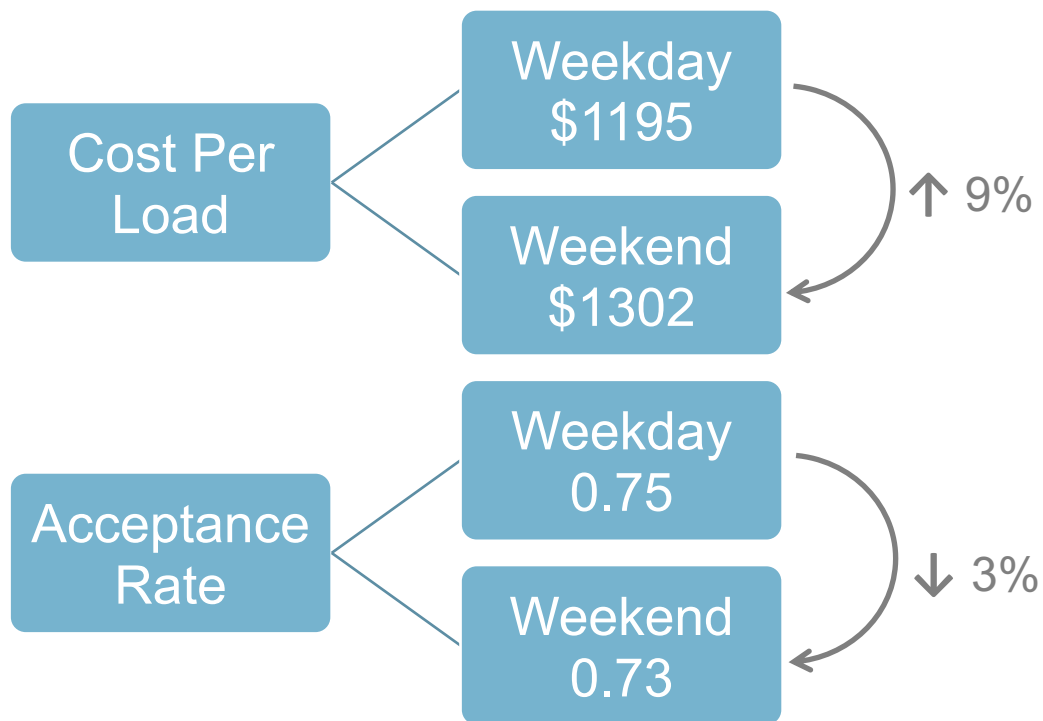
Impact of Lane Consistency and Volatility



The impact of volatility is more profound in high consistency lanes.

Data Modeling Results – Weekends & Quarter Ends

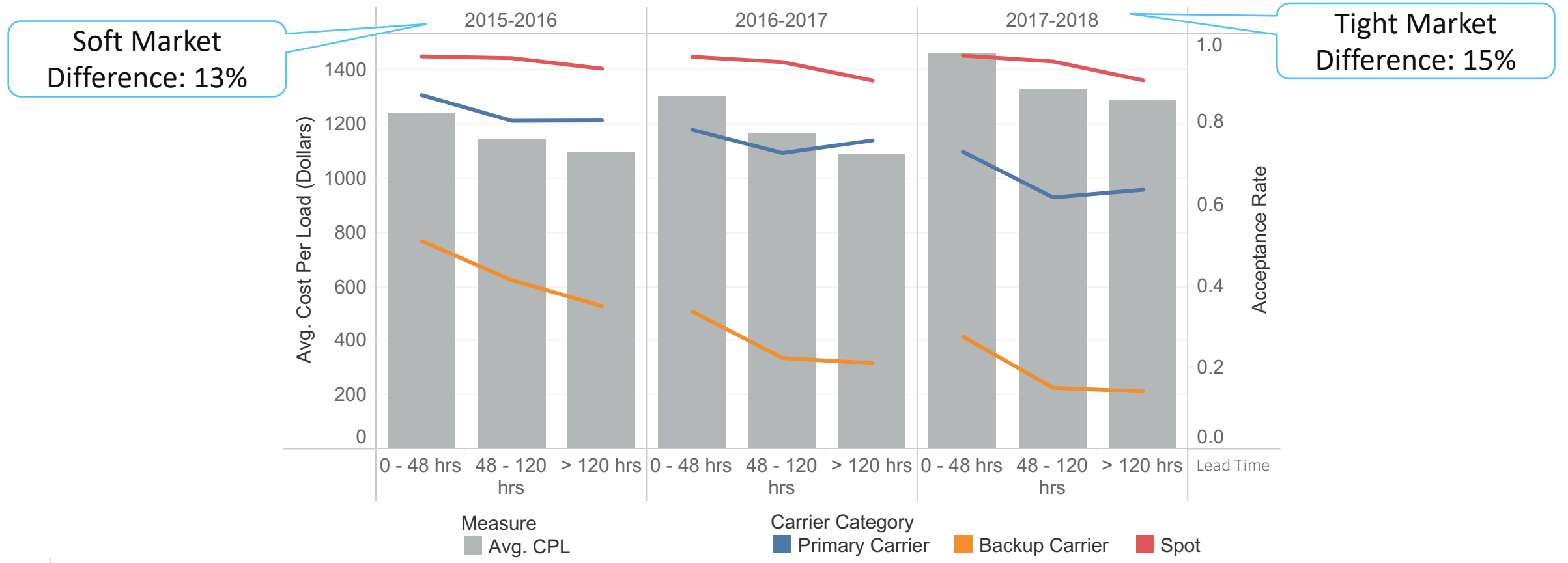
- *Weekend: Friday, Saturday, Sunday*
- *Quarter Ends: Last 5 days of each quarter*



Data Modeling Results – Lead Time

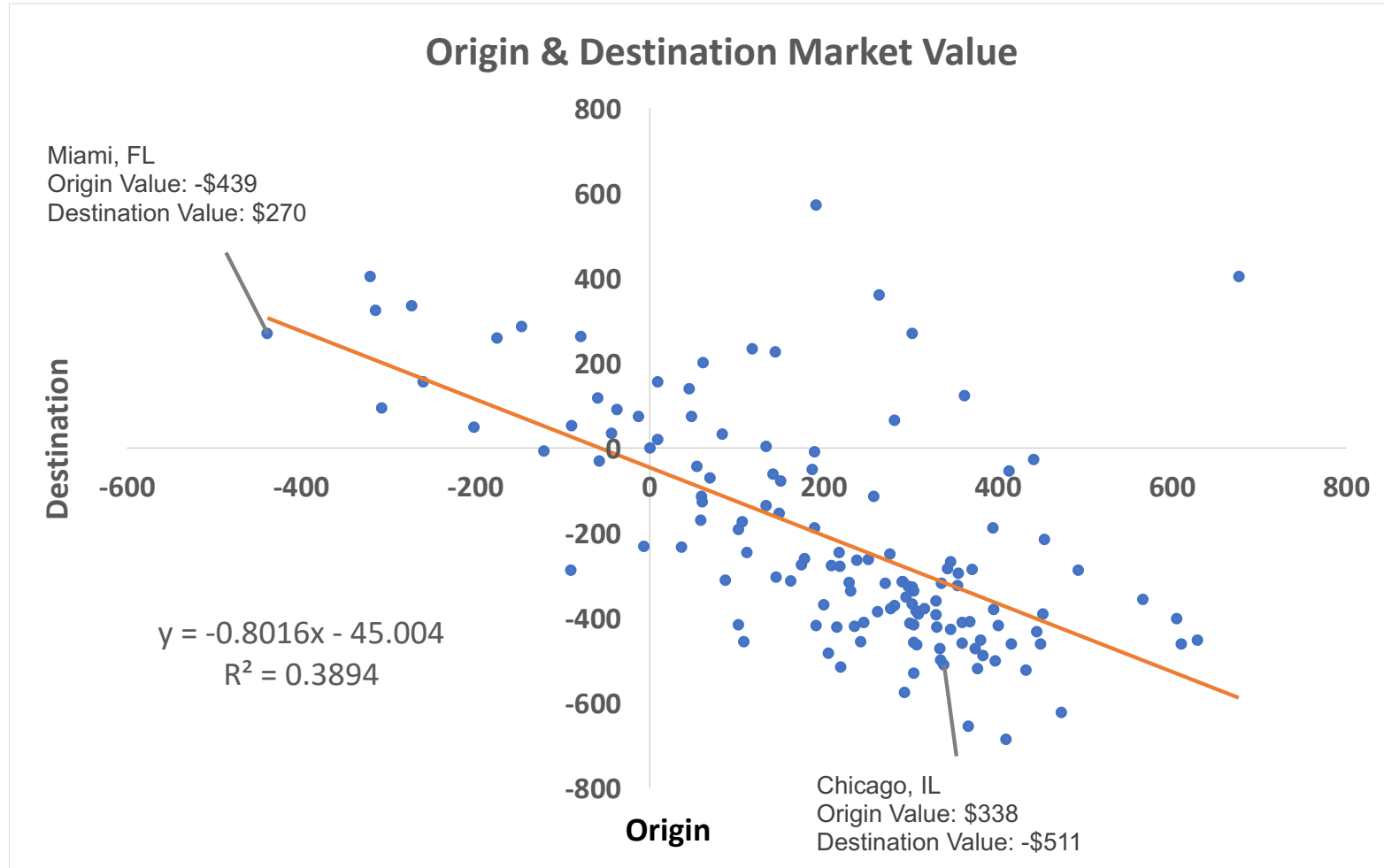
- *Lead time: the time between tendered date and pickup date*
- *Shorter the lead time, higher the cost per load.*
- *Increasing lead time decreases acceptance rates and increases the likelihood of going to spot market.*

Impact of Lead Time



Data Modeling Results – Origin & Destination

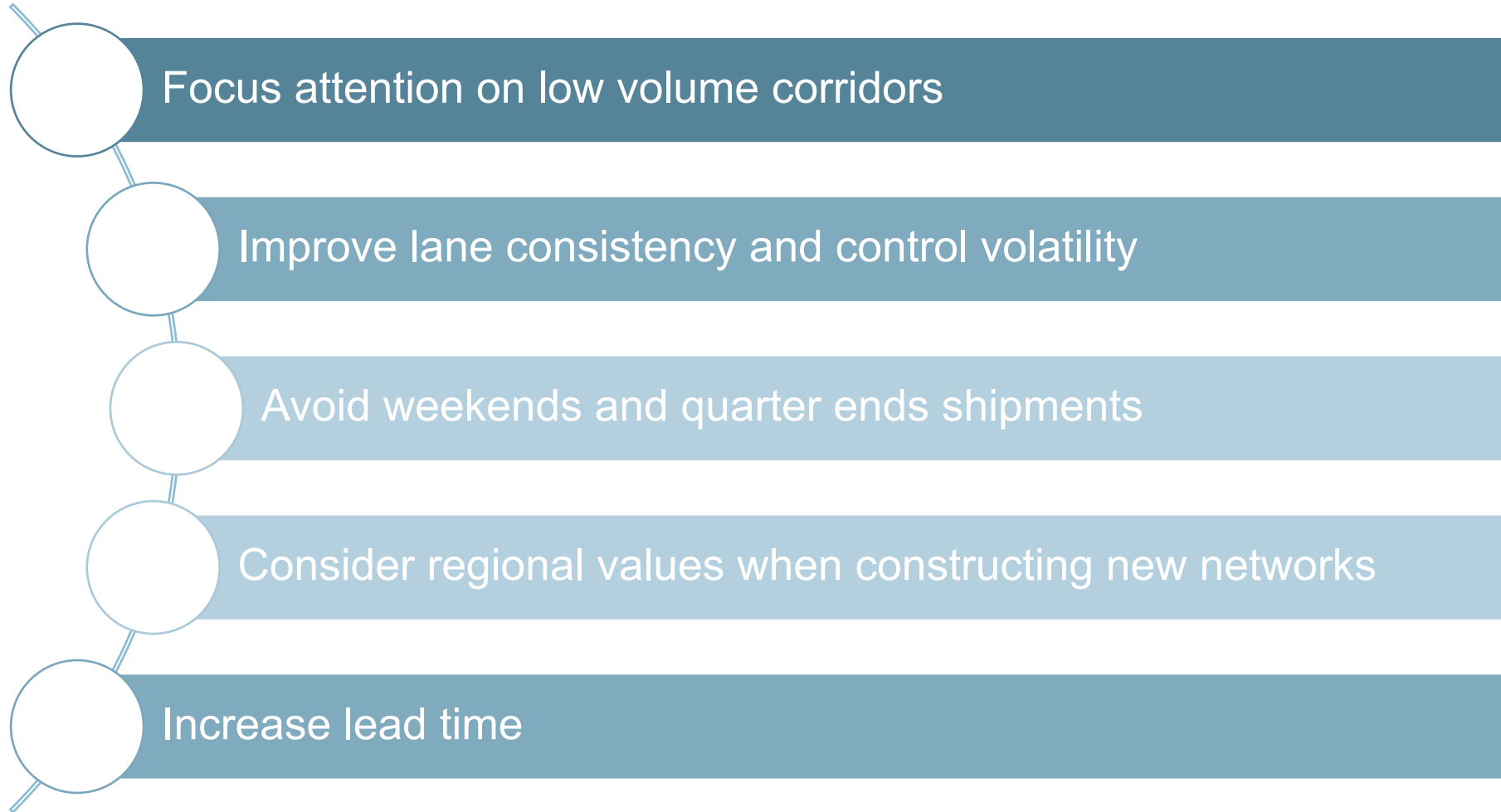
- 135 distinct key market areas
- If a key market area is a cheaper origin, it is likely to be an expensive destination and vice-versa.



Data Modeling Summary

Variables	Cost Per Load	Primary Acceptance	Routing Guide Failure
Distance	↑	-	-
Corridor Volume	↓	↑	↓
Lane Consistency	↓	↑	↓
Lane Volatility	↑	↓	↑
Weekends	↑	↓	↑
Quarter Ends	↑	↓	↑
Lead Time	↓	↓	↓
Regions	Various		

Managerial Implications



Limitations

- The impact of lead time on primary tender acceptance rate
- The combined effects of different factors
- Regression models capture the correlation but not the causation

Suggestions

- Lead time: carriers' capability of managing short lead time loads
- Market index: impact on tender acceptance rates
- Seasonality in demand
- Network design with regional sensitivity

Thank You

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