

Improving Starting Price Point for Customer Re-Negotiations using XGBoost

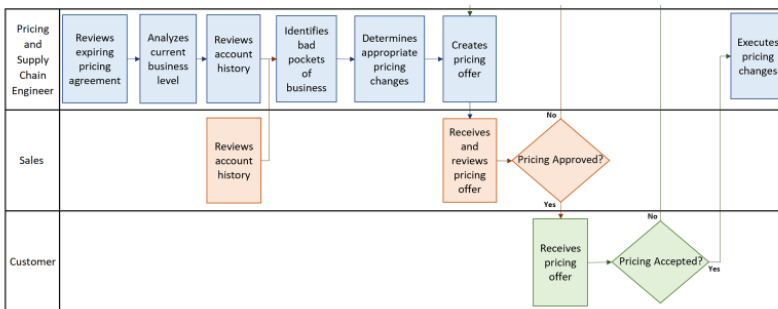
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ArcBest

ArcBest is a publicly traded, global, \$5 billion transportation logistics company with many subsidiaries including: ArcBest Technologies, U-Pack, MoLo, Panther Premium Logistics, and ABF Freight. ABF Freight is the largest of ArcBest's subsidiaries and specializes in less-than-truckload (LTL) shipments. Over 50% of ABF Freight's business is setup on a pricing structure that requires re-negotiation of rates on a year basis.



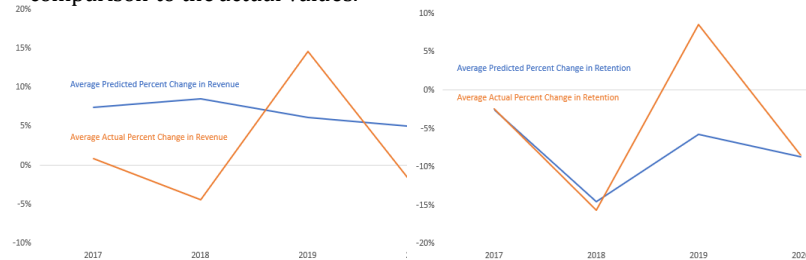
Current Re-Negotiation Process



ArcBest's Pricing and Supply Chain Engineering department handles the re-negotiation of existing customers' yearly pricing agreement two-and-a-half months before expiration. The assigned engineer conducts analysis on the account's history making appropriate pricing changes based on factors such as operating ratios, revenue, and shipment levels. Currently, there is a need for a more streamlined process with less variation among engineers.

Analysis of Current Revenue and Retention

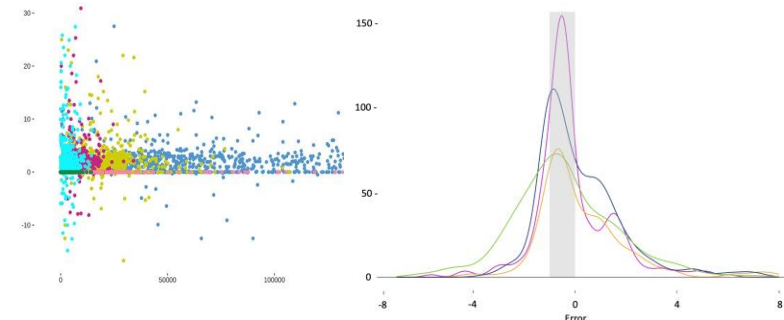
ArcBest's current performance metrics include average monthly revenue and customer retention. ArcBest's engineers accurately predicted most of the retention values, while the predicted revenue varies greatly in comparison to the actual values.



After analyzing both revenue and retention and discussing our project further with our industry partners, we decided not to use them in our prediction of a re-negotiation starting price point. We decided to move forward with grouping customers based on similar negotiation patterns.

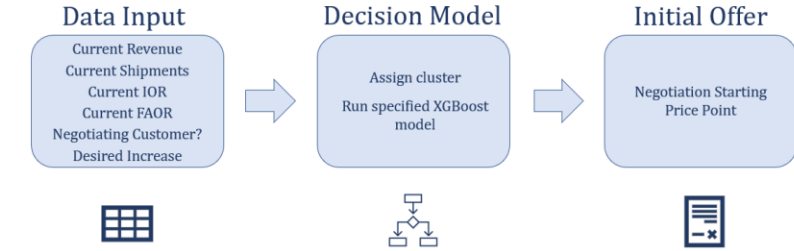
Assigning Customers to Groups

We grouped customer accounts into six bins based on their average monthly revenue and whether or not they negotiated their price increase. We then created an XGBoost prediction model for each bin and assessed the acceptable error percentage of each model. We consider an acceptable error as any error that falls in the range of [-1,0]. In addition to the six-bin grouping method, we assessed the performance of several other formal clustering techniques and found that the original method resulted in the highest percentage of acceptable error.



Customer Negotiation Prediction Tool

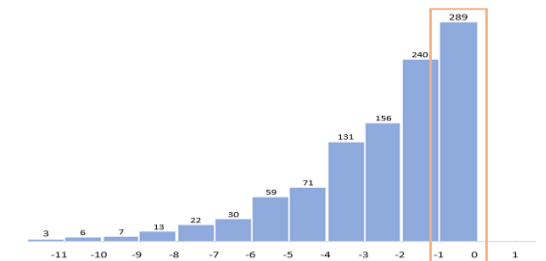
Our decision support tool uses historical data from each account to categorize customers and predict the initial revenue increase offer.



The user interface was developed using Shiny in R. An engineer will provide six inputs to the tool, run it, and receive a starting point for the negotiation. The outputted result addresses the performance of the account without risking losing that customer to competitors.

Impact and Results

Using the 2022 customer data given to us by ArcBest, we compared the observed amount the customer negotiated to our XGBoost model prediction and found that on average our model overpredicted the amount negotiated by 3%.



Overall, our decision support tool reduces the amount of time it takes an engineer to find a negotiation starting price point in addition to providing more confidence in their negotiation tactics.

