

## Regression Clustering for Estimating Product-Level Price Elasticity with Limited Data

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ARTICLE INFO	ABSTRACT
<p><b>Keywords:</b> Regression clustering Price elasticity Heuristics</p> <p>Received 7 September 2020 Revised 15 December 2020 Accepted 20 December 2020</p> <p><b>Article Classification:</b> Research Article</p>	<p><b>Purpose</b> – Pricing is a strategic competitive leverage and firms increasingly utilize data-driven pricing methods. Estimates of product-level price elasticities are needed to determine the best prices for each product, hence reliable estimation is of first-order importance. However, due to the increasing number of products and dynamics of customer behavior, relevant historical data is often limited.</p> <p><b>Design/methodology/approach</b> – The objective of this paper is to jointly cluster products with similar price elasticities and estimate this cluster-specific quantity using regression clustering. An extension of the regression clustering problem. Two heuristics are proposed: The gradient descent-based heuristic iterates through feasible solutions to increase cluster-specific regression fit. The categorical ordering heuristic fits a regression for each product, orders the products based on the mean response, and splits them at the largest gap. Using simulated and real-world datasets, a comparative performance analysis is conducted.</p> <p><b>Findings</b> – Using the gradient descent-based heuristic with multiple starting solutions gives the best performance. The computational times could decrease with smart initial solutions, which is especially critical if the number of products is large. The categorical ordering heuristic, the fastest method, performs better when there are more than two clusters but suffers from robustness problems.</p> <p><b>Discussion</b> – The findings show that offered heuristics are effective to estimate product-specific price elasticity with limited data. Firms could leverage these estimates to increase revenues and profits by better aligning product prices with demand. Given that many products have limited relevant data, the extent of the applications of our method is quite large which, in turn, could help firms stay competitive.</p>

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