a neural network approach to predicting price negotiation outcomes in business-to-business contexts

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price premiums are a key profit driver for long-term business relationships. for sellers in business relationships, it is important to have appropriate strategies to negotiate price increases without trading off the relationships with their buyers. This paper aims to understand the annual price negotiation processes of companies by predicting whether a seller’s reservation price, target price, and initial offer positively
affect the price negotiation outcome between the sellers and buyers. Data from 284 B2B relationships of a chemicals supplier based in Germany was used to examine our research model. In order to capture the non-linear decisions that are involved in price negotiations and to address collinearity among negotiations’ determinants, neural network analysis was used to predict the factors that influence price negotiation outcome. The neural network
imply that price targets should be actively managed, e.g. through clear financial aims or through seminars aiming to help sales personnel to establish more challenging negotiation aims.
model was then compared with the results from regression analysis. Compared to regression analysis, the neural network has a lower standard error, and it showed that target price played a more important role in B2B price negotiations. The neural network was also able to measure non-linear, non-compensatory decisions that are involved in price negotiations. The results imply that neural networks should be more widely used by researchers to address the threats that multi-collinearity poses. For companies, the results
1. Introduction

• Price negotiations play an important role in business as their outcomes can impact long-term business relationships’ profitability and the reputation of businesses (Carbonneau, Kersten, & Vahidov, 2008).

• Several conclusions can be drawn from existing studies of pricing negotiations.
• Firstly, existing studies in price negotiations are overly experimental (Krause, Terpend, & Petersen, 2006), often using student samples, and transactional in nature.

• Secondly, linear regression models are often chosen to examine the relationships between the determinants of price negotiations and their outcomes.
• Thirdly, a limitation of regression models is the assumption of independent determinants.
• However, the seller’s price preferences in negotiations are often interdependent.
Objectives

• This research has several objectives.
• Firstly, this study aims to understand the factors that can predict the price negotiation outcomes in B2B relationships.
• Secondly, this research aims to examine whether non-linear, non-compensatory decision models such as neural networks provide a better model fit and forecasting than linear regression models for predicting pricing negotiation outcomes.
• Lastly, based on the results, this research will suggest how companies can maintain profitable long term B2B relationships by managing sales personnel’s trust in pricing negotiations, and how researchers can use neural networks to help address multi-collinearity issues.
Neural network overview

• A neural network (or artificial neural network) is a “massively parallel distributed processor made up of simple processing units, which have a natural propensity for storing experimental knowledge and making it available for use.”
Neural network models are typically comprised of nodes or neurons that are ordered into hierarchical layers.
Advantages of neural networks

- Neural networks have several advantages when compared to the traditional linear statistical methods.
- The non-linearity in neural networks is important as it allows for the investigation of relationships between inputs and outputs which are non-linear.
Another advantage of the neural network is that its input and output mapping can be accomplished without meeting the assumptions of sample distribution which are often required in linear regression studies.
Methodology

- In order to test the model we collected data on the European B2B sales activities of a global player in the chemical industry based in Germany. We chose the chemical industry due to its economic relevance and because it sells to clients in a diverse field of industries.
- In line with the recommendation to use the most qualified informants for gathering information on an issue under investigation (Kumar, Stern, & Anderson, 1993), we invited the negotiating sales staff of the company to be our key informants.
Data

• For each relationship we investigated, we collected the sellers’ reservation price, target price and initial offer before the negotiation started. The price negotiation outcome was collected after the negotiation.

• All these variables are manifest single item measures and describe relative price increases.
Multiple regression analysis

• We performed multiple regression analysis to determine how the different price references influence the eventual price negotiation outcomes.

• To support the assumed linear relationship, each price reference was plotted against the price negotiation outcome without any non-linear relationship being identified.

• No auto-correlation was found based on Durbin–Watson scores. Heteroscedasticity was analyzed, based on plots of the residuals and no particularities were identified.