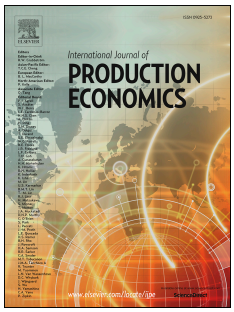
Accepted Manuscript



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PII: S0925-5273(18)30340-2

DOI: 10.1016/j.ijpe.2018.08.022

Reference: PROECO 7140

To appear in: *International Journal of Production Economics*

Received Date: 27 September 2017

Revised Date: 8 August 2018

Accepted Date: 20 August 2018

Please cite this article as: Jahani, H., Abbasi, B., Alavifard, F., Talluri, S., Supply chain network redesign with demand and price uncertainty, *International Journal of Production Economics* (2018), doi: 10.1016/j.ijpe.2018.08.022.

Supply Chain Network Redesign with Demand and Price Uncertainty

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Abstract

When new products are introduced into a supply chain, the existing logistics may no longer optimally meet the objectives of the enterprise. This paper provides an analytical approach to redesigning a supply chain network (SCN), considering its current infrastructure. While aiming to maximise total profit, we take into consideration the demand and price uncertainty and their correlation as two important risk factors, and formulate them using associated Brownian motions employed in a real options pricing approach. Our model captures multiple periods and cash flow aspects through a non-linear structure. In the solution approach, we apply a novel piecewise linear conversion. Our theoretical model is complemented by a realistic case study from the Australian cement industry. We demonstrate significant improvements in the financial position of the company after redesigning its SCN. For instance, SCN redesign increases total profit by 49%, while the profit from the existing product increases by 23%. The results also indicate that ignoring the effect of the correlation leads to profit overestimation.

Keywords: Supply chain management, Supply chain network (SCN), Real option (RO), Geometric Brownian motion (GBM), Stochastic demand and price.

1. Introduction

In today's highly competitive business environment, the frequent launch of new products is an integral part of companies' growth strategies. Manufacturing companies are under

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