Yang, Shitao; **Yang, Jian**; **Abdel-Malek, Layek**
Sourcing with random yields and stochastic demand: a newsvendor approach. (English)
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Summary: We studied a supplier selection problem, where a buyer, while facing random demand, is to decide ordering quantities from a set of suppliers with different yields and prices. We provided the mathematical formulation for the buyer's profit maximization problem and proposed a solution method based on a combination of the active set method and the Newton search procedure. Our computational study shows that the proposed method can solve the problem efficiently, and is able to generate interesting and insightful results that lead us to various managerial implications. In today's globally competitive environment, decision makers in supply chains face numerous challenges particularly regarding the selection of suppliers or outsourcing partners. To assist in this endeavor, we examined a double-layered supply chain where a buyer facing the end users has the option of selecting among a cohort of suppliers. The available suppliers may have different yield rates and unit costs. The buyer has to decide, given the stochastic nature of the problem's governing parameters, whether or not to order from each supplier, and if so how much. We developed a 'newsvendor-style' model for the problem, and proposed a solution algorithm for it. Numerical studies were performed to provide some insights for supplier selection and order quantity decisions.

Reviewer: Reviewer (Berlin)

MSC:

90C30	Nonlinear programming
91B70	Stochastic models in economics

Cited in **20** Documents

Keywords:

supply chain; supplier selection; newsvendor; nonlinear programming

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References:

[1] Vollmann, T.E.; Berry, W.L.; Whybark, D.C.; Jacobs, F.R., Manufacturing planning and control systems for supply chain management, (2005), Irwin/McGraw-Hill Boston

[2] El-Haggar, S.M.; Baher, R., Design, manufacturing and testing of a waste paper recycling system, International journal of environment and pollution, 11, 2, 211-227, (1999)

[3] Bitran, G.R.; Dasu, S., Ordering policies in an environment of stochastic yields and substitutable demands, Operations research, 40, 5, 999-1017, (1992) · Zbl 0775.90139

[4] Hsu, A.; Bassok, Y., Random yield and random demand in a production system with downward substitution, Operations research, 47, 2, 277-290, (1999) · Zbl 0979.90011

[5] Grosfeld-Nir, A.; Gerchak, Y.; He, Q., Manufacturing to order with random yield and costly inspection, Operations research, 48, 5, 761-767, (2000) · Zbl 1106.90325

[6] Zakaria F. Does the future belong to China? Newsweek, May 9, 2005.

[7] Dornier, P.P.; Ernst, R.; Fender, M.; Kouvelis, P., Global operations and logistics: text and cases, (1998), Wiley New York

[8] McDougall, P. Optimizing through outsourcing, Information week, March 5, 2004.

[9] Aeppel T. Manufacturers cope with costs of strained global supply lines. Wall Street Journal. New York, NY, December 8, 2004. p. A.1 [Eastern edition].

[10] Wang, Y.; Gerchak, Y., Periodic review production models with variable capacity, random yield, and uncertain demand, Management science, 42, 130-137, (1996) · Zbl 0851.90059

[11] Karlin, S., One stage inventory models with uncertainty, ()

[12] Yano, C.A.; Lee, H.L., Lot sizing with random yields: a review, Operations research, 43, 311-334, (1995) · Zbl 0832.90031

[13] Ozekici, S.; Parlar, M., Inventory models with unreliable suppliers in a random environment, Annals of operations research,

91, 123-136, (1999) · Zbl 0970.90005

[14] Bollapragda, S.; Morton, T.E., Myopic heuristics for the random yield problem, Operations research, 47, 713-722, (1999) · Zbl 0976.90002

[15] Gupta, D.; Cooper, W.L., Stochastic comparison in production yield management, Operations research, 53, 2, 377-384, (2005) · Zbl 1165.90436

[16] Ciarallo, F.W.; Akella, R.; Morton, T.E., A periodic review, production planning model with uncertain capacity and uncertain demand—optimality of extended myopic policies, Management science, 40, 320-332, (1994) · Zbl 0805.90052

[17] Porteus, E.L., Stochastic inventory theory, () · Zbl 0736.90026

[18] Abdel-Malek, L.; Montanari, R., On the multi-product newsvendor problem with two constraints, Computers and operations research, 32, 8, 2095-2116, (2005) · Zbl 1068.90003

[19] Van Mieghem, J.A.; Rudi, N., Newsvendor networks: inventory management and capacity investment with discretionary activities, Manufacturing and service operations management, 4, 313-335, (2002)

[20] Gurler, U.; Parlar, M., Inventory problem with two random available suppliers, Operations research, 45, 6, 904-918, (1997) · Zbl 0895.90073

[21] Parlar, M.; Perry, D., Inventory models of future supply uncertainty with single and multiple suppliers, Naval research logistics, 43, 2, 191-210, (1998) · Zbl 0870.90054

[22] Gurnani, U.; Akella, R.; Lehoczky, J., Optimal order policies in assembly systems with random demand and random supplier delivery, IIE transactions, 28, 11, 865-878, (1996)

[23] Gurnani, H.; Akella, R.; Lehoczky, J., Supply management in assembly systems with random yield and random demand, IIE transactions, 32, 8, 701-714, (2000)

[24] Anupindi, R.; Akella, R., Diversification under supply uncertainty, Management science, 39, 8, 944-963, (1993) · Zbl 0785.90040

[25] Parlar, M.; Wang, D., Diversification under randomness in inventory models, European journal of operational research, 66, 1, 52-64, (1993) · Zbl 0795.90013

[26] Dada M, Petruzzi NC, Schwarz LB. A newsvendor's procurement problem when suppliers are unreliable. Working paper, 2005, Krannert Graduate School of Management, Purdue University.

[27] Freedman, D.; Pisani, R.; Purves, R., Statistics, (1997), W.W. Norton & Company New York

[28] Luenberger, D.G., Linear and nonlinear programming, (1989), Addison-Wesley Reading, MA · Zbl 0241.90052