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Joint pricing and inventory control with a Markovian demand model. (English)
Zbl 1127.90004

Summary: We consider the joint pricing and inventory control problem for a single product over a finite horizon and with periodic review. The demand distribution in each period is determined by an exogenous Markov chain. Pricing and ordering decisions are made at the beginning of each period and all shortages are backlogged. The surplus costs as well as fixed and variable costs are state dependent. We show the existence of an optimal (s, S, p)-type feedback policy for the additive demand model. We extend the model to the case of emergency orders. We compute the optimal policy for a class of Markovian demand and illustrate the benefits of dynamic pricing over fixed pricing through numerical examples. The results indicate that it is more beneficial to implement dynamic pricing in a Markovian demand environment with a high fixed ordering cost or with high demand variability.

Reviewer: Reviewer (Berlin)

MSC:

90B05	Inventory, storage, reservoirs
90C40	Markov and semi-Markov decision processes

Cited in **7** Documents

Keywords:

joint pricing and inventory control; Markovian demand; optimal feedback policy

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References:

[1] Beyer, D.; Sethi, S.; Taksar, M., Inventory models with Markovian demands and cost functions of polynomial growth, Journal of optimization theory and applications, 98, 2, 281-323, (1998) · Zbl 0908.90108

[2] Chan, L.; Shen, Z.; Simchi-Levi, D.; Swann, J., Coordination of pricing and inventory decisions: A survey and classification, Handbook of quantitative supply chain analysis modeling in the E-business era, (2004), Kluwer · Zbl 1125.91322

[3] Chen, X.; Simchi-Levi, D., Coordinating inventory control and pricing strategies with random demand and fixed ordering cost: the finite horizon case, Operations research, 52, 6, 887-896, (2004) · Zbl 1165.90308

[4] Chen, X.; Simchi-Levi, D., Coordinating inventory control and pricing strategies with random demand and fixed ordering cost: the infinite horizon case, Mathematics of operations research, 29, 3, 698-723, (2004) · Zbl 1082.90025

[5] Chen, H., Wu, O., Yao, D.D., 2004. Optimal pricing and replenishment in a single product inventory system. Working paper.

[6] Chen, F.Y.; Ray, S.; Song, Y., Optimal pricing and inventory control policy in periodic-review systems with fixed ordering cost and lost sales, Naval research logistics, 53, 2, 117-136, (2006) · Zbl 1106.90008

[7] Cheng, F.; Sethi, S.P., Optimality of state-dependent (\textit{s},S) policies in inventory models with Markov-modulated demand and lost sales, Production and operations management, 8, 2, 183-192, (1999)

[8] Chiang, C.; Gutierrez, G.J., Optimal control policies for a periodic review inventory system with emergency orders, Naval research logistics, 45, 2, 187-204, (1998) · Zbl 0903.90050

[9] Chod, J.; Rudy, N., Resource flexibility with responsive pricing, Operations research, 53, 3, 532-548, (2005) · Zbl 1165.90433

[10] Elmaghraby, W.; Keskinocak, P., Dynamic pricing in the presence of inventory considerations: research overview, current practices and future directions, Management science, 49, 10, 1287-1309, (2003) · Zbl 1232.90042

[11] Federgruen, A.; Heching, A., Combined pricing and inventory control under uncertainty, Operations research, 47, 3, 454-475, (1999) · Zbl 0979.90004

[12] Feller, W., An introduction to probability theory and its application, Vol. II, (1971), Wiley New York · Zbl 0219.60003

[13] Feng, Y., Chen, F.Y., 2003. Joint pricing and inventory control with setup costs and demand uncertainty. Working Paper.

[14] Feng, Y., Chen, F.Y., 2004. Optimality and optimization of a joint pricing and inventory-control policy for a periodic-review system. Working paper.

[15] Gayon, J.-P., Degirmenci, I., Karaesmen, F., Ormeci, E., 2004. Dynamic pricing and replenishment in a production-inventory system with Markov-modulated demand. Working paper. · Zbl 1231.90049

[16] Huh, W., Janakiraman, G., 2005. Optimality results in inventory-pricing control: An alternative approach. Working paper.

[17] Li, L., A stochastic theory of the firm, Mathematics of operations research, 13, 3, 447-466, (1988) · Zbl 0651.90040

[18] Parlar, M.; Wang, Y.; Gerchak, Y., A periodic review inventory model with Markovian supply availability, International journal of production economics, 42, 131-136, (1995)

[19] Petruzzi, N.C.; Dada, M., Pricing and the newsvendor model: A review with extensions, Operations research, 47, 2, 183-194, (1999) · Zbl 1005.90546

[20] Polatoglu, H.; Sahin, I., Optimal procurement policies under price-dependent demand, International journal of production economics, 65, 141-171, (2000)

[21] Scarf, H., The optimality of (\textit{S},s) policies in the dynamic inventory problem, (), 96-202 · Zbl 0203.22102

[22] Sethi, S.P.; Cheng, F., Optimality of (\textit{s},S) policies in inventory models with Markovian demand, Operations research, 45, 6, 931-939, (1997) · Zbl 0895.90079

[23] Song, J.S.; Zipkin, P., Inventory control in a fluctuating demand environment, Operations research, 41, 2, 351-370, (1993) · Zbl 0798.90035

[24] Talluri, K.T.; van Ryzin, G.J., The theory and practice of revenue management, (2004), Kluwer · Zbl 1083.90024

[25] Veinott, A., On the optimality of (\textit{s},S) inventory policies: new conditions and a new proof, SIAM journal on applied mathematics, 14, 5, 1067-1083, (1966) · Zbl 0173.47603

[26] Whitin, T.M., Inventory control and price theory, Management science, 2, 61-80, (1955)

[27] Yin, R., Rajaram, K., 2005. Joint pricing and inventory control with a Markovian demand model. Working paper. University of California, Los Angeles.