Management Insights

On the Benefit of Inventory-Based Dynamic Pricing Strategies
Hong Chen, Owen Wu, and David Yao

Many companies adjust prices based on inventory levels to maximize their profits. Chen, Wu, and Yao report a number of insights. First, dynamic pricing is most effective when the finished-goods inventory is expensive to hold and expensive to replenish in small batches. Second, the forms of demand variability (e.g., price sensitive or insensitive demand variability) have significant impact on the benefit of dynamic pricing. Third, the inventory-based dynamic pricing is best implemented jointly with the right inventory decision. A suboptimal replenishment quantity can easily undo any benefit from dynamic pricing. Fourth, the number of price changes used in a replenishment cycle has a strong diminishing marginal benefit. Using a few price changes per cycle, one can typically capture most of the benefit from dynamic pricing strategies.

Optimization and Coordination of Fresh Product Supply Chains with Freshness-Keeping Effort
Xiaoqiang Cai, Jian Chen, Yongbo Xiao, Xiaolin Xu

In fresh-product supply chains, preventing the likely spoilage of fresh products such as live seafood, fresh fruits, and cut flowers is a primary concern, especially when long distance transportation is involved. The freshness-keeping efforts such as the packaging standard, the cooling facility, or the transportation mode play a crucial role in minimizing the possible loss. Cai, Chen, Xiao, and Xu analyze a fresh-product supply chain with a single producer and a monopoly distributor and present mathematical expressions for the optimal wholesale price for the producer and the optimal order quantity and market price for the distributor. They report the distributor has to adopt the proper freshness-keeping effort, not larger nor less; the strategies of the chain members in the decentralized and centralized systems could change sharply if the cost structure of the freshness-keeping effort changes; and in general, the producer and the distributor should coordinate under an appropriate contract, especially when the product is very prone to spoilage or the customers are very sensitive to the freshness of the product.

Dynamic Assignment of Flexible Service Resources
Yalçın Akçay, Anant Balakrishnan, Susan H. Xu

Resource flexibility can facilitate matching of capacity and demand so as to increase revenues and improve service levels. A service firm has to decide which incoming jobs it should accept and what resources it should assign to each accepted job. Akçay, Balakrishnan, and Xu show that with flexible resources, a Bottleneck Capacity Reservation policy is quite effective in generating near-optimal solutions over a wide range of problem scenarios. They also consider a model variant that requires dynamic job acceptance decisions but permits deferring resource assignment decisions until the end of the horizon.

Keyword Auctions, Unit-Price Contracts, and the Role of Commitment
Jianqing Chen, Juan Feng, Andrew Whinston

Performance-based unit-price contract auctions refer to a type of auction in which bidders bid unit prices and the winner is chosen based on both their bids and performance levels. Such auctions are commonly used in procurement settings such as highway and national defense contracting, as well as in keyword auctions adopted by major search engines such as Yahoo! and Google where advertisers bid on their willingness to pay per click. When auctioneers design performance-based auctions, it is important to realize that some lower-performance bidders may invest in improving their performance level in order to increase their chances of winning. Chen, Feng, and Whinston consider the effect of performance-based allocation rule on bidders' performance investment choices, and prescribe the design of a revenue-maximizing policy and a socially efficient policy for auctioneers taking into account bidders' performance improvement. In addition, as such contracts may last a long period of time, an improvement in the bidder's performance may give auctioneers an incentive to modify the auction policy over time. The authors find that a fully committed auctioneer is able to generate more expected revenue and that the auctioneer should give less preferential treatment to low-performance bidders to encourage them to improve than an auctioneer who cannot fully commit.

A Model for Partial Product Complementarity and Strategic Production Decisions under Demand Uncertainty
Xiang Fang and Yunzeng Wang

Many manufacturers, especially in the automobile and electronic industries, produce and sell complementary products to a common downstream assembler or a common market. In addition to this common demand stream, each firm may have its individual market. For a firm operating under such a situation, finding a best policy to determine its production capacity or quantity can be complicated. Such a policy needs first to take into account the access of a product to multiple markets with different characteristics. Second, a firm needs to consider the fact that the sales of its product to the major market can be constrained by the availability of all other products in the complementary set offered by other firms. Consequently, firms involved in such channels will behave strategically when making their individual decisions, and their decisions collectively determine the channel performance as well as individual firm performance. Fang and Wang use a game-theoretical framework to characterize the production strategy and performance of each firm. They show that when a manufacturer's production cost decreases or a manufacturer's selling price increases, all the manufacturers would produce more, and everyone is better off. They also show that when a manufacturer's two demand streams become more positively correlated, this manufacturer is worse off, but other manufacturers may either benefit or hurt from it.

ABC Classification: Service Levels And Inventory Costs
Ruud Teunter, Mohamed Zied Babai, Aris Syntetos

ABC inventory classifications are widely used in practice, with demand value and demand volume as the most common ranking criteria. The standard approach in ABC applications is to set the same service level for all SKUs in a class. However, this leads to solutions that are far from optimal. We propose a new ranking criterion that significantly reduces the safety stock cost (usually by more than 50%, based on 3 large real life datasets) whilst achieving the same service level. The new criterion is also more general than existing ones in that it can take criticality of SKUs into account. We therefore advocate its use in practice. Further managerial insights are obtained into what class should have the highest or the lowest service level.

Intelligent Procedures for Intra-Day Updating of Call Center Agent Schedules
Vijay Mehrotra, Özgür Özlük, Robert Saltzman

For nearly all call centers, call forecasts and agent schedules are typically created several days or weeks prior to the time that agents report to work. However, once the original forecasts and schedules have been created, there are many different factors that can have a significant effect on the actual volume and pattern of calls that ultimately arrive to the call center. Call volumes early in the day can be useful in making more accurate predictions about what will happen during the remainder of the day. Mehrotra, Özlük, and Saltzman examine this phenomenon and propose a framework for making adjustments to agent schedules to better match the updated forecasts. They also test their method using data from an actual call centers operations and demonstrate significant improvement in the quality of service delivered as a result of their forecast and schedule updating method.