

NYU Stern School of Business
Department of Information, Operations & Management Sciences
OPERATIONS MANAGEMENT RESEARCH SEMINAR

TOPIC: The Impact of Linear Optimization on Promotion Planning

SPEAKER: Georgia Perakis (MIT)

DATE: Monday, May 5, 2014

TIME: 12:30 PM-1:30PM

PLACE: KMC 8-170

ABSTRACT

In many important settings, promotions are a key instrument for driving sales and profits. Examples include promotions in supermarkets among others. The Promotion Optimization Problem (POP) is a challenging problem as the retailer needs to decide which products to promote, what is the depth of price discount to use and finally, when to schedule the promotions. In this talk we introduce and discuss an optimization formulation for this problem that captures several important business requirements as constraints.

We propose two general classes of demand functions depending on whether past prices have a multiplicative or an additive effect on current demand. These functions capture the promotion fatigue effect emerging from the stock-piling behavior of consumers and can be easily estimated from data. The objective is nonlinear (neither convex nor concave) and the feasible region has linear constraints with integer variables. Since the exact formulation is "hard", we propose a linear approximation that allows us to solve the problem efficiently as a linear program by showing the integrality of the integer programming formulation. We develop analytical results on the accuracy of the approximation relative to the optimal (but intractable) POP solution by showing guarantees relative to the optimal profits.

Together with our industry collaborators from Oracle Retail, our framework allows us to develop a tool which can help supermarket managers to better understand promotions by testing various strategies and business constraints. We show that the formulation we propose solves fast in practice using actual data from a grocery retailer and that the accuracy is high. We calibrate our models using actual data and determine that they can improve profits by 3% just by optimizing the promotion schedule and up to 5% by slightly modifying some business requirements.

Joint work with Maxime Cohen, Zachary Leung (PhD students at MIT ORC) and Kiran Panchamgam and Anthony Smith (Oracle RGBU).

BIO

Georgia Perakis is the William F. Pounds Professor at the Sloan School of Management at MIT since 1998. She received an M.S. degree and a PhD in Applied Mathematics from Brown

University and a BA from the University of Athens in Greece. Perakis is currently visiting Columbia University as she is on sabbatical.

Georgia Perakis' research interests include applications of operations research in many areas such as pricing, energy applications, supply chain management and transportation among others. She has widely published in journals such as Operations Research, Management Science, POM, Mathematics of Operations Research and Mathematical Programming among others. She has received the CAREER award from the National Science Foundation and subsequently, the PECASE award from the office of the President on Science and Technology awarded to the 50 top scientists and engineers in the nation. She has also received an honorable mention in the TSL Best Paper Award, the second prize in 2011 and the first prize in 2012 in the Best Paper competition of the Informs Service Science Section for two of her papers, the Graduate Student Council Teaching Award for excellence in teaching, the Samuel M. Seegal prize and the Jamieson Prize for Excellence in Teaching. Perakis was the recipient of the Sloan Career Development Chair and subsequently of the J. Spencer Standish Career Development Chair. In 2009, Perakis received the William F. Pounds chair that she currently holds. Perakis has passion supervising her students and builds lifelong relationships with them. So far she has graduated fifteen PhD and twenty two Masters students. She has been awarded the Samuel M. Seegal prize at MIT for “inspiring students to pursue and achieve excellence”.

Perakis is currently serving as the co-director from the MIT Sloan School side for the Leaders for Global Operations (former LFM) program. She is also currently the group head of the Operations Management Group at MIT Sloan. She serves as an Associate Editor for the journals Management Science, Operations Research and Naval Logistics Research and a senior editor for POM. Perakis has served as a member of the INFORMS Council. She served as the chair of the Pricing and Revenue Management Section of INFORMS and in 2009-2010 as the VP for Meetings of the MSOM Society of INFORMS. She has co-organized the MSOM 2009 conference and served in the organizing committee of the 2010 MSOM conference. She has also been the co-chair and co-organizer of the Annual Conference of the INFORMS Section on Pricing and Revenue Management for several years and the chair of the cluster on the same topics for the annual INFORMS and ISMP conferences for several years.