

## Decision Systems Engineering Fall '13 Seminar Series

“The Vendor’s Optimal Policy for Stock Replenishment and Shipment Scheduling under Temporal Shipment Consolidation: Structural Properties and Exact Characterization”

### FEATURING



**Sila Çetinkaya, Professor**  
Industrial and Systems Engineering  
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**Friday, November 22nd - 12:00 PM – 1:15 PM**  
**BYENG 210**

### Abstract:

We consider a joint stock replenishment and shipment scheduling problem applicable under a vendor-managed inventory (VMI) contract where the vendor has flexibility over the timing and quantity of resupply at a group of retailers located in a given geographical region. The retailers face stochastic demands. Under the VMI contract of interest, employing a *temporal shipment consolidation* strategy allows the vendor to hold smaller orders from the retailers and to release them in a combined shipment to realize transportation scale economies. Although the problem of interest has been investigated using renewal theory in the previous literature, computation of exact optimal policies has remained an open problem for over a decade. We formulate the problem via a stochastic dynamic programming approach. We examine the optimal joint policy specifying the *vendor’s inbound replenishment and outbound dispatch quantities* in successive periods so that transportation economies of scale due to shipment consolidation are realized without excessive inventory holding and/or order delay. We characterize the structure of the optimal policy as a *zoned, state-dependent threshold policy* that falls in a new class of policies in stochastic inventory control theory. The results extend the existing theory and concepts of generalized convexity while also generalizing Scarf’s seminal work on the notion of  $K$ -convexity and optimality of  $(s,S)$  policies.

### Bio:

Sila Çetinkaya is Professor of Industrial and Systems Engineering at TAMU. She joined TAMU faculty in 1997 after obtaining her Ph.D. in Management Science from McMaster University. She also holds M.S. and B.S. degrees, both in Industrial Engineering, from Bilkent University and Istanbul Technical University, respectively. Her research interests include supply chain management, inventory theory, stochastic optimal control, and applied probability. She has been a department editor for *IIE Transactions*, an associate editor for *Naval Research Logistics*, and a member of the editorial board of *International Journal of Inventory Research*. Çetinkaya received an NSF CAREER Award in 2001. She was named Outstanding Young Industrial Engineer in Academia in 2003 and IIE Fellow in 2012.

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