

# The Impact of Duplicate Orders on Demand Estimation and Capacity Investment

Mor Armony\* and Erica L. Plambeck#

*\*Stern School of Business, New York University, New York, NY 10012*

*#Graduate School of Business, Stanford University, Stanford, CA 94305*

## Abstract

Motivated by a \$2.2 billion inventory write-off by Cisco Systems, we investigate how duplicate orders can lead a manufacturer to err in estimating the demand rate and customers' sensitivity to delay, and to make faulty decisions about capacity investment. We consider a manufacturer that sells through two distributors. If a customer finds that his distributor is out-of-stock, then he will sometimes seek to make a purchase from the other distributor; if the latter is also out-of-stock, the customer will order from both distributors. When his order is filled by one of the distributors, the customer cancels any duplicate orders. Furthermore, the customer cancels all of his outstanding orders after a random period of time.

Assuming that the manufacturer is unaware of duplicate orders, we prove that she will overestimate both the demand rate and the cancellation rate. Surprisingly, failure to account for duplicate orders can cause short-term underinvestment in capacity. However, in long term equilibrium under stable demand conditions the manufacturer overinvests in capacity. Our results suggest that Cisco's write-off was caused by estimation errors and cannot be blamed entirely on the economic downturn. Finally, we provide some guidance on estimation in the presence of double orders.