

MATCHING SUPPLY AND DEMAND IN PRODUCTION-INVENTORY SYSTEMS: ASYMPTOTICS AND INSIGHTS

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We consider a general class of production-inventory systems based on both lost-sales and backorder inventory models. Such systems require a fundamental understanding of the asymptotic behavior of key performance measures under various supply strategies, as well as the pre-planning of these strategies. Our analysis relies on a thorough study of the asymptotic behavior of a random walk with power drift, which is of independent interest. In addition to providing key insights, our analysis leads to approximations of the corresponding optimization problem that yield simple solutions which are close to optimal. We also establish an equivalence between the lost-sales and backorder models when both have the same penalty cost that becomes large. Numerical comparisons of various approaches are presented, quantifying the accuracy of our approximations with respect to the exact solution.