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# Dynamic Product Portfolio Management with Life Cycle Considerations

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**Abstract**

We consider a portfolio of products in which each product probabilistically transitions through various life cycle stages. The evolution through these life cycle stages is impacted by both marketing support and product launch decisions, which are bound by a financial constraint in the form of restricted working capital. In the model, the joint working capital level serves to finance the portfolio expenditures and is decided a priori by the company. We use an infinite-horizon Markov Decision Process (MDP) to find the optimal decisions to coordinate the operations and finance depending on the composition of the portfolio. We find that the policy optimizing the product launch, marketing support and inventory decisions under a working capital constraint is independent of the correlation between demand levels of the products in the portfolio. We numerically demonstrate that the joint management of the products has a significant positive effect on the total profit, reducing the amount of working capital used per product. We also show that the optimal policy smooths aggregated demand levels as well as cash flows.

*Keywords:* Product Portfolio Management; Life Cycle; Working Capital; Markov Decision Process; Inventory Control.

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