

**PhD Candidate full name:**

Mariana Silva Sousa

**Dissertation Title:** Integrating consumer behavior into the management of perishable products

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**Abstract or Public Summary:** Perishable food products are at the core of grocery retail, yet their limited shelf life and progressive loss of freshness create substantial operational challenges. As products approach the end of their shelf life, consumers' willingness to pay for them declines sharply, increasing the risk of revenue loss and waste. Despite this, many assortment and markdown decisions still rely on demand models that treat price as the primary driver of choice. In practice, however, consumers evaluate price, freshness, and markdown signals jointly, and they frequently substitute across closely related alternatives within a category. This dissertation demonstrates that incorporating consumer behavior is crucial for understanding and optimizing outcomes in perishable categories. It develops an integrated analytical approach that links consumers' valuation of freshness to retailers' assortment and markdown decisions. Using transaction-level data from a large European grocery retailer, the dissertation combines empirical consumer choice modeling with optimization and decision-support methods. The empirical analysis highlights two behaviorally decisive mechanisms. First, freshness valuation is highly nonlinear, with demand declining disproportionately as products near expiration. Second, explicit low remaining shelf life labels introduce an adverse signaling effect that depresses demand beyond what would be predicted by freshness alone. Together, these mechanisms influence both purchase timing and substitution patterns, intensifying cannibalization within product families. These insights are embedded into two decision support tools designed for retail practice. The first is a simulation-based assortment optimization model that integrates freshness-dependent demand with inventory dynamics, enabling an explicit characterization of trade-offs among profitability, cannibalization, and waste. The second is a dynamic markdown model that formulates markdown decisions as a sequential optimization problem solved via reinforcement learning, enabling coordinated decisions across time, products, and freshness states. Overall, this dissertation provides a unified and empirically grounded link between consumer choice and retail operations. The results demonstrate that accounting for freshness-dependent

willingness to pay, substitution effects, and promotional signaling can significantly alter assortment and markdown policies, thereby improving profitability while reducing food waste.

**Principal Supervisor at INESC TEC:** Pedro Amorim

**Additional Supervisor:** Maria João Santos (INESC TEC); Sara Martins (INESC TEC)

**Scientific Domain:** [Artificial Intelligence]; [Operations Research]

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