Expiry date visibility

ECR Discussion session

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Intro: the research team from TU Eindhoven (NL)

Active in research on retail operations (>15 years) in cooperation with supermarket chains via research and student projects

Examples:

• Quantifying the improvement potential for fresh departments in 27 stores at 3 large retailers in EU (ECR Sell More, Waste Less project)
• Implementation of Fresh Case Cover concept at Albert CZ (savings €1 mln/year)
• Internships at Jumbo, Jan Linders, Albert Heijn, Spar, Plus, Lidl, Delhaize, Makro a.o. on: Demand forecasting during promotions; Higher OSA in bread departments; Added value of humans in ordering, etc.

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Sell more, waste less, be fresh, be smart

With perishables, important Key Performance Indicators (KPI) for retailers, customers, and society are:

• OSA (On-Shelf Availability)
• Freshness: remaining shelf life for customer
• Waste: expired products
• Handling: removing expired products (compliance) and FIFO rotation
• Fraction of sales from the oldest batch (FIFO)
The curse of grabbing

We have grabbing (or LIFO) if some customers prefer products from newer, fresher batches and are willing to reach to the back of the shelf

• Need more shelf life and/or have more time for shopping
• Distrust the products offered in front (bad experience?)

Grabbing decreases OSA and increases waste and handling for the store
Unknown grabbing behaviour

Customer behaviour determines FIFO fraction $f^C$ (their intention to grab)

Shelf management and order policy determine actual grabbing $f^A \geq f^C$

- Grabbing requires at least 2 batches
- Just in time backroom replenishment can limit the number of batches on the shelf
- Last day discounting can change customer behaviour
Value of expiry date visibility: no visibility

Without Expiry Date (ED) visibility, the retailer has only stock level data

- The local store can only adjust the target inventory level to set OSA
- Case pack size Q and store shelf life SL are determined by the supplier
- Customer intention $f^C$ is unknown
- Actual FIFO fraction $f^A$ is also unknown (optimistic assumption $f^A = 1.0$)
- Shelf must always be checked for expired products SL periods after arrival of a batch (with last day discounting even more frequent)
Vicious cycle in case of no expiry date visibility

Increase target inventory → Freshness decreases → Grabbing increases → Waste increases → Handling increases

OSA (becomes) less than desired

Settle for a lower OSA?
Benefits of full expiry date visibility

Insight in grabbing behaviour: \( f^C \) and \( f^A \) can be calculated

- Using scan data at the checkouts (from RFID tags or 2D barcodes)

Improved ordering (timing and/or order size):

- By compensating for Expected Withdrawal and Aging (EWA policy)
- Target inventory level is independent of store shelf life and grabbing
- Store only needs to check for expired products when there is waste
- FIFO demand during the shelf life of the oldest batch was less than the batch size: \( f^A \cdot D(t, t + SL) < B_t \)
Lower level of detail: batch ED visibility

Register shelf life of each incoming batch and estimate $f^C$ based on sales and waste registration (no need for item-level tagging).

Achieves the benefits of full ED visibility by a smart estimating procedure.

Basic assumption: accurate inventory (supply = sales + waste).
Estimating grabbing behaviour (% FIFO)

Situations observed in empirical data with at least 2 batches (1 old), demand, and no OOS
Number of observations needed to estimate $f^C$?

Estimation procedure uses Bayesian updating to improve initial $f^C (= 0.5)$

Tested the procedure with simulation using data from Jumbo Supermarkten

For all SKU’s, roughly 20 observations are needed to be within 10% relative error

Required period length (days) to get these 20 observations depends on OSA and shelf life

Example of simulations for a single SKU
For which category is ED visibility most beneficial?

And for which KPI?
- OSA
- Freshness
- Waste
- Handling
- Other?
Case study at Jumbo Supermarkten

Jumbo has “Every Day Lost Cost” and no last day discounting

Products with relatively higher sales have more grabbing

Grabbing differs more between product categories than between stores

Category Fruits & Vegetables (F&V) benefits most from insight in grabbing

• Waste reduction between 4% (for $f^C = 0.8$) and 8% (for $f^C = 0.4$)
Conclusion and discussion

Expiry date visibility has major benefits for perishables with short shelf lives that suffer from grabbing by customers.

Efficient procedure available to estimate grabbing using batch level data.

Recommendation:
• Start with a pilot in category F&V
• Potential reduction of 8% in waste (at same OSA)