Manual "Sell More, Waste Less" tool

Introduction

The 'Sell More, Waste Less' tool is a Excel file with macros to calculate several Key Performance Indicators (KPI's) for the inventory systems at retail stores, specific for fresh (perishable) items.

- On Shelf Availability (OSA): percentage of customer demand delivered from the shelf;
- Waste: total waste per period as a percentage of total demand in the same period. Both waste and demand are measured in consumer units (CU's);
- Freshness to customer: the average number of remaining shelf life in days that the customer gets when buying the item;
- Number of order lines: the average number of order lines per day. If an item is ordered once every 20 days, this number is equal to 0.05;
- Probability non-empty shelf: the probability that the shelf for this item is not empty just before a new delivery is made for this item <u>or</u> another item in its category (i.e. when the store looks most empty);

The tool can handle many situations encountered in practice. This version for the ECR Europe OSA & Shrinkage Group makes several restricting assumptions to achieve a better user experience, but most of these assumptions can be relaxed by using an advanced version of the tool.

- Lead time (between ordering and shelf stacking) is one day;
- Inventory review frequency (to determine replenishment orders) is once per day per category;
- Most shoppers buy oldest items first (FIFO)
- The store replenishment logic takes into account the number of items which expire tomorrow.

Experienced users can also make tailor made worksheets using the standard functions available in the 'Sell More, Waste Less' tool. These users are advised to contact the authors for a more extensive user manual.

Email: r.a.c.m.broekmeulen@tue.nl or k.h.v.donselaar@tue.nl

Copyright notice and disclaimer

The 'Sell More, Waste Less' tool has copyright, which means that all rights are held by the authors Broekmeulen & Van Donselaar. While the authors made every effort to ensure that the tool is error-free, errors do occur. We ask that you notify us immediately of any errors that you discover in our tool. We will make every effort to correct them.

Getting started

Step 1: Open the Excel file that contains the tool

The tool is a macro-enabled Excel file (XLSM) and requires to be trusted by the operating system. When opening the Excel file, please enable the macro content, otherwise the added functionality is not available. For more information about enabling macros, see the website of [Microsoft Office](#).

Step 2: Choose a worksheet, depending on the evaluation scenario

The parameters that determine the expected OSA and waste can be evaluated in two different scenarios. For each scenario a different worksheet is available:
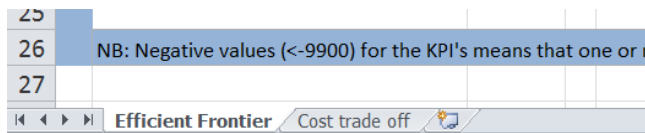
- Efficient Frontier: in this scenario, a minimal target level for OSA can be set, based on the corresponding waste level according to the efficient frontier for the given parameters. This is a good starting point for evaluation;
- Cost trade off: in this scenario, the costs related to waste, out-of-stocks and ordering are shown as a function of the % OSA for the given parameters. This is suitable for retailers who prefer to minimize the total relevant costs.

Step 3A: Setting the basic parameters

In both scenarios, three basic product parameters are needed for the calculations (see top left corner of the worksheet, cells C4, C5 and C6):

Product parameters	Value
Average daily demand [CU/day]	0.5
Case pack size [CU]	4
Store shelf life [days]	11
Fresh Case Cover	0.73

- Average daily demand [CU/day]: average demand per week in consumer units (CU) divided by 7 (to get demand per day);
- Case pack size [CU]: replenishment orders are in a multiple of this number;
- Store shelf life [days]: the average time in days between the arrival of an item in the store and its expiration date.

If you need a reminder of the definition of these parameters, please click in the cell.

	Product parameters	Value	KPI / Reor
3			
4	Average daily demand [CU/day]	0.5	% OSA
5	Case pack size [CU]	4	% Waste
6	Store shelf life [days]		ess
7	Fresh Case Cover		r o
8			ilit
9			
10			

Case pack size
Replenishment orders are in an integer multiple of this number

Step 3B: Setting the cost parameters (only for 'Cost trade off' scenario)

In the 'Cost trade off' scenario, the tool needs four additional parameters for the calculations (see middle left side of the worksheet, cells C10, C11, C12 and C13):

			Pro
8			
9	Cost parameters		Co
10	% margin of sales price	40.0	
11	% OOS substitution	50.0	
12	% lost sales cost of sales price	200.0	
13	% ordering cost of sales price	1.0	
14			

- % margin of sales price: gross margin as a percentage of the customer sales price;
- % OOS substitution: percentage of customers buying a substitute in the store if their preferred item is out of stock (OOS);
- % lost sales cost of sales price: the penalty cost per consumer unit, as a percentage of the sales price, if the customer faces a stock out <u>and</u> is unwilling to substitute;
- % ordering cost of sales price: the fixed ordering cost per order line as a percentage of the sales price per CU

Step 4: Read the output from the tool

The tool provides the user with graphs as well as detailed output for the KPI's. In the graphs, the output is plotted as a function of the %OSA. The graph which shows how %Waste increases if OSA increases is called the Efficient Frontier.
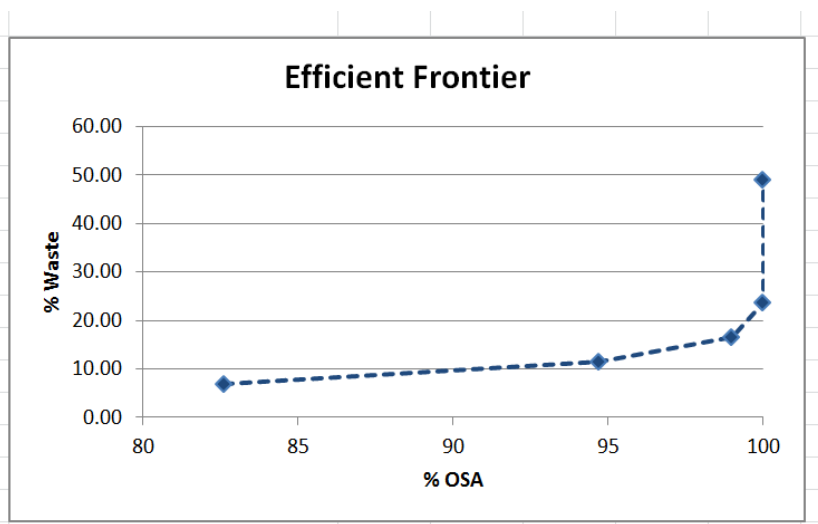
The detailed output is shown in the upper right corner.

| E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
& Van Donselaar of TU/e, the Netherlands.															
KPI / Reorder level	1	2	3	4	5	6	7	8	9	10	11	12	13	14	
% OSA	82.62	94.72	98.99	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	
% Waste	6.89	11.42	16.56	23.70	48.92	54.40	68.10	83.35	118.29	126.19	142.50	158.97	192.05	208.63	
Freshness to customer [days]	7.46	6.34	5.07	3.91	3.94	2.93	2.48	2.18	2.84	2.27	2.10	1.96	2.41	2.28	
Number of order lines	0.11	0.13	0.14	0.15	0.19	0.19	0.21	0.23	0.27	0.28	0.30	0.32	0.36	0.38	
Probability non-empty shelf	0.75	0.91	0.98	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	

The range F3:S3 shows different reorder levels. A reorder level is a target inventory level: if the inventory position for the item drops below this level, a new inventory replenishment order is created. The first value in this row starts with the reorder level for which the OSA is at least 80%. The subsequent rows show the resulting KPI's for each reorder level.

In the 'Efficient Frontier' scenario, the user selects the reorder level which meets her minimal target OSA. For example: if the minimal target OSA = 93%, the output of the tool above shows that the reorder level should be set equal to 2 consumer units. With this reorder level the resulting %OSA=94.7% and the resulting %Waste=11.4%. Note that the minimal target OSA levels cannot be reached exactly, due to the fact that reorder levels are always integer.

In the 'Cost trade off' scenario, we have an additional output row: Cost per € demand. This is the total relevant costs per day divided by the potential turnover per day (i.e. when OSA=100%). The tool automatically highlights the minimal costs (in red, see below).

E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
& Van Donselaar of TU/e, the Netherlands.															
KPI / Reorder level	1	2	3	4	5	6	7	8	9	10	11	12	13	14	
% OSA	82.62	94.72	98.99	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	
% Waste	6.89	11.42	16.56	23.70	48.92	54.40	68.10	83.35	118.29	126.19	142.50	158.97	192.05	208.63	
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Number of order lines	0.11	0.13	0.14	0.15	0.19	0.19	0.21	0.23	0.27	0.28	0.30	0.32	0.36	0.38	
Probability non-empty shelf	0.75	0.91	0.98	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Cost per € demand	0.22	0.12	0.11	0.15	0.30	0.33	0.41	0.50	0.72	0.76	0.86	0.96	1.16	1.26	

In addition, a graph is made which shows how the total relevant costs per € demand depend on the % OSA.

Cost trade off
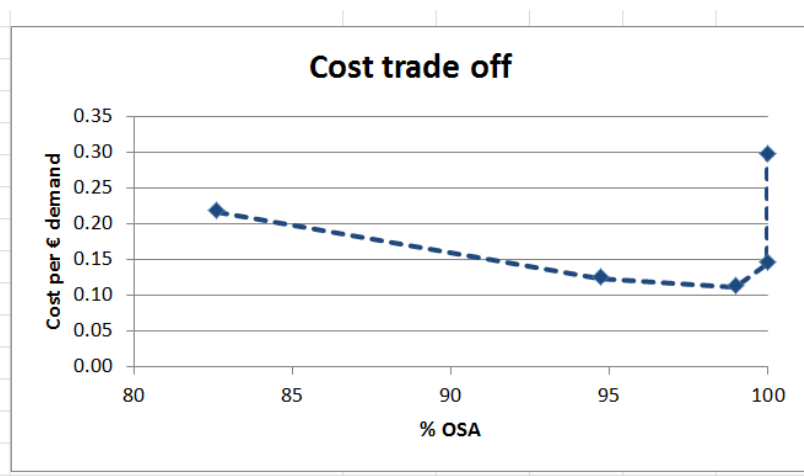
Step 5: What-if analyses

The user can do what-if analyses by changing the input parameters, such as case pack size and store shelf life. Consider the following example with an average daily demand of 0.5 CU/day, a case pack size of 4 CU and a store shelf life of 11 days. In the base scenario we have the following output:

KPI / Reorder level	1	2	3	4	5
% OSA	82,62	94,72	98,99	100,00	100,00
% Waste	6,89	11,42	16,56	23,70	48,92

When we increase the store shelf life with 1 day to 12 days, we get:

KPI / Reorder level	1	2	3	4	5
% OSA	82,62	94,72	98,99	100,00	100,00
% Waste	5,15	8,95	12,87	18,31	38,32

An alternative scenario is unpacking the case pack at the distribution center; such that the store can order with a case pack size of 1 (store shelf life is back to 11 days).

KPI / Reorder level	2	3	4	5	6
% OSA	85.46	96.41	99.52	100.00	100.00
% Waste	0.47	4.69	9.59	17.16	28.38

Tips for calculating the right input parameters

For the functions, the input parameters must be within certain ranges to be valid, such as being non-negative. The functions return error codes (starting from -9900) in case of invalid input values.

For determining the average daily demand, first determine the average <u>weekly</u> demand and then divide this by 7. When calculating the average weekly demand, make sure you exclude promotional weeks and weeks when the item was not on sale in the store. Although the tool makes no correction for a possible week pattern in sales, simulation studies revealed that the impact of this week pattern on the trade-off between OSA and %Waste is limited.

When using cost or substitution parameters: please check whether these are different for different product categories or products.