

Simulation modeling in Renque

This document describes the Renque model [InventoryOptimization.zip](#). The model represents the following optimization problem: A delicatessen retailer has established a regular sales volume of about 10 items per day for a rather exclusive product. The wholesaler supplies the product in order quantities of 100 items. The product has an expiration period of 15 days upon delivery, and the delivery time is 3 days. The retailer intends to check the stock inventory every day and place an order when the number of items in stock becomes less than a predetermined threshold value.

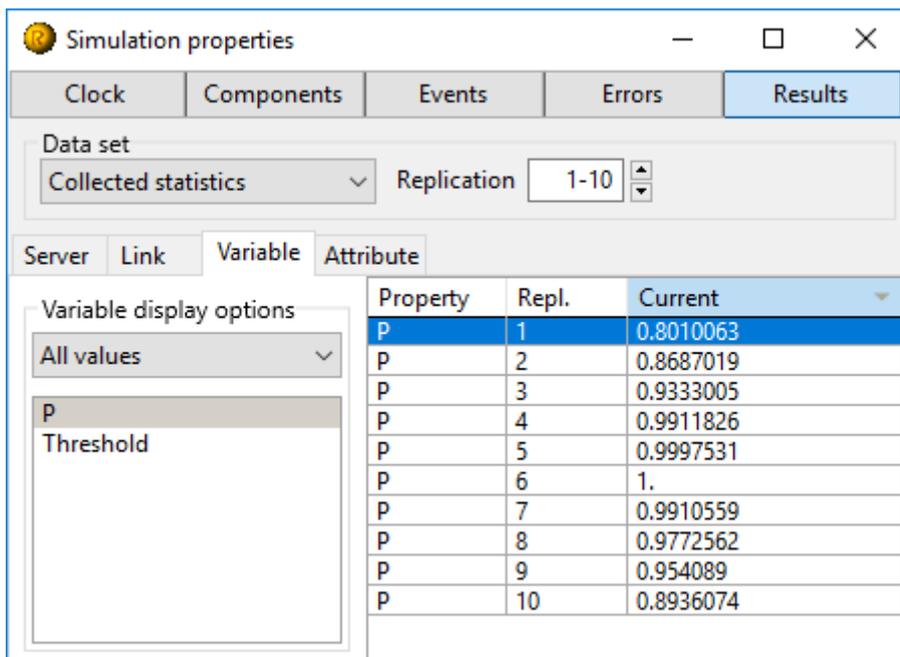
What should be the threshold to maximize profit? If the threshold is too high profit will be reduced by loss of expired items. If the threshold is too small the demand for the product can not be fully satisfied.

The simulation model runs a series of **10 replications** of the product vending process with different values for the restocking threshold value. The simulation period was set to 400 **days**. The simulation runs uses the schedule component **Sched_RepStart** to change the value of **Threshold** variable at the start of a each replication within a range of 10 - 100 by the following script:

```
Threshold = 10 * Sim.Clock.Replication
```

The schedule component **Sched_RepEnd** assigns the fraction of successful sales with respect to the total number of acquired products to Variable **P** at the end of each replication. The schedule component **Sched_Orders** deals with the daily ordering procedure.

The simulation results for the sales ratio can be viewed on the Results tab of the Simulation properties window for the Recorded statistics of variable **P**. The column labeled *Current* represents the value for P assigned by the schedule Sched_RepEnd for each replication. The value *1-10* in the Replication selector field instructs the viewer to display the results for all replications, with the *Repl.* column indicating the **replication number**.



The screenshot shows the 'Simulation properties' window with the 'Results' tab selected. The 'Data set' is 'Collected statistics' and the 'Replication' range is '1-10'. The 'Variable' tab is active, showing a list of variables including 'P' and 'Threshold'. A table displays the recorded statistics for variable 'P' across 10 replications.

Property	Repl.	Current
P	1	0.8010063
P	2	0.8687019
P	3	0.9333005
P	4	0.9911826
P	5	0.9997531
P	6	1.
P	7	0.9910559
P	8	0.9772562
P	9	0.954089
P	10	0.8936074

The chart below was created by copy/pasting these results to MS-Excel. The chart displays the value of variable **P** as a function of the **replication number**. There appears to be an optimal value for replication 6, which corresponds to the value 60 for the **Threshold** variable.

