

Assignment Inventory Management: The Kava Case

Inventory & Production Management (35V3A4-B-6)

2024

1 Introduction

Mr. Stark is inventory manager of Kava, a company that supplies coffee machines and related components all over Europe. Mr. Stark has been working for Kava for over 20 years. When he started working for Kava he could manage the inventory policies of all SKUs quite satisfactorily. Over the years, the number of SKUs has grown tremendously and the product life cycles have decreased making it more and more difficult to manage. The last three years, the performance of Kava's inventory management is simply disappointing. Customer service went down and the overall profitability declined. Currently, Mr. Stark is under a lot of pressure from his boss to increase the performance, especially after two long-time customers left Kava for one of their competitors.

Stark realizes that his old customs, which were working so nicely in the past, are not suitable for these modern times. Since he doesn't have a clue what is the source of the decline in performance he decides to start with a thorough analysis of their top-rated product EasyCoffee, which is the SKU that caused one of their customers to abandon Kava and move to another supplier.

2 EasyCoffee analysis

The local sales offices all over Europe gather their customer orders and provide Mr. Stark with their aggregate demand by the end of each week. The orders have to be shipped from the central warehouse to the regional depots first thing next week to make sure the orders are delivered to the customers on time. Orders that cannot be satisfied immediately are fully back-ordered, however, the customer contracts specify that a customer is entitled to a 5% discount on the sales price in that case.

One of the things that could be improved, Mr. Stark believes, is the demand forecasting. The market for products such as EasyCoffee is growing, so he wonders whether the forecasting method should include a trend component. A complicating factor, however, is that Kava's customer share isn't constant, because customers change suppliers more frequently nowadays.

As for all SKUs, EasyCoffee is controlled by a (R, S) policy with a fixed review period of 4 weeks. This is a policy introduced many years ago by Stark to save on the handling and inspection costs, and the policy was never reconsidered. The order-up-to level for EasyCoffee is based on a time-supply rule and currently is 32,000 units.

Kava purchases EasyCoffee from their supplier Poklad for a price of € 120. Poklad is a very reliable supplier and always delivers in exactly 2 weeks. This particular item is sold by Kava to its customers with a profit margin of 10% on top of the purchase price.

A cost analysis has revealed that an annual carrying charge of 25% applies to the warehouse. Furthermore, order preparation, handling and inspection is estimated at a cost of € 500 per order. Ideally, Mr. Stark would like to minimize the costs of his inventory control policy, hence the discounts Kava has to offer to its customers in case of a stockout definitely should be taken into account. He feels, however, that loss of goodwill should be taken into consideration as well to represent the possible loss of customers. A fixed amount for each stockout occasion seems appropriate to him, but he hasn't got a clue how to estimate this amount. Therefore, for the time being, Mr. Stark decides it might be better to revert to a fill rate target of 99% instead of using a cost model.

A preliminary study has already revealed that there is no good balance between the ordering costs and the carrying costs. Therefore, Mr. Stark wants to reconsider the length review period to change the size of the order quantities.

3 Assignment

General directions

- Write a concise report answering the discussion questions below. It is *not* necessary to write a management style report. It should be clear from your answer, how you obtained numerical results by stating assumptions, the model (formulas) used and all input parameter values and how these were obtained. (I should be able to replicate the results if I wanted to.)
- Please add Matlab code or Excel sheets as *supporting* material, but *not as a replacement* to explain the numerical results. (I should not have to look at the code to see how results were obtained.)
- The assignment should be made in groups as explained on Canvas. Submit your assignment on Canvas. The assignment should be finished at the latest by Friday, April 5, 2024, 23:59.
- The datasets are named "demand-2024_x.txt", please use the specific dataset where "x" is your group number.
- If you have any further questions, please send me an email on j . c . wagnaar _ 1@uvt . nl.

Discussion questions

- (1) The sales department has provided the weekly demands for EasyCoffee over the last two years. Analyze EasyCoffee's historical demand pattern, and give a suggestion for an appropriate forecasting procedure. Compare exponential smoothing for a level model and a trend model, and assume that Mr Stark wants to revise the smoothing constants only once a year. Based upon your choice, calculate aggregate forecasts for each of the next six weeks. Also give an estimate of the forecast error standard deviation for the aggregate forecasts in each of these six weeks. More precisely, if the current period is period t (week 104 in our case), we need the forecast $\hat{\mu}_\tau(t)$ for the total (aggregate) demand in periods $t+1, \dots, t+\tau$ for $\tau = 1, 2, \dots, 6$, and corresponding forecast error standard deviation $\hat{\sigma}_\tau(t)$.
- (2) Use previous forecasting analysis to estimate the performance in the near future if the current inventory control policy is maintained. The minimal set of KPIs considered should at least cover the cycle service level, fill rate, ordering costs, holding costs, shortage costs (lost margin), and total costs. Note that you do *not* have to estimate the *past* performance for EasyCoffee. You can restrict yourself to analyzing a single replenishment cycle, however, extrapolate the costs to a yearly basis. Hence, any trend or changes in the demand pattern in subsequent replenishment cycles can be ignored.
- (3) For the (R, S) system with a review period of 4 weeks, determine the order-up-to level that minimizes the expected total costs ignoring any possible goodwill costs, and compute corresponding KPIs using the forecast.
- (4) Also determine the order-up-to level that meets the service target set by Mr Stark and estimate the corresponding KPIs.
- (5) To help Mr Stark decide on an appropriate value for the goodwill cost, come up with a plot that shows the relationship between the fill rate and the implied goodwill costs *per item short (backordered)*. What estimate for the goodwill costs per item short should Mr Stark use if he sticks to his fill rate target of 99%?
- (6) Suppose that you are free to set the length of the review period R to any integer number of weeks. Ignoring stockout costs and customer service levels, what review period would you pick to obtain an optimal trade-off between the ordering costs and the holding costs? Use the answer to derive a new order-up-to level S that satisfies Mr Star's original fill rate target for this new review period. Now also include the expected goodwill costs (per year) as a KPI. Use the cost estimate determined in (5) that corresponds to the fill rate target 99%.
- (7) Would it make any sense to use a (s, Q) or even a (s, S) inventory policy instead of the (R, S) policy in Kava's situation? Why?
- (8) Give an overview of the KPIs of all inventory control policies from the previous parts in a table.

- (9) What other (qualitative) recommendations can you make about the inventory management practices and strategies at Kava?