

*Image source: Quora*

Context

Any manufacturing and asset intensive organization carries out maintenance activities routinely to maintain assets. These maintenance operations require parts. These spares are used as break fix or replacement parts during preventive or predictive maintenance activities. These parts to be purchased from vendors and kept in stock. Purchase lead time varies and so the demand from maintenance operations. It is crucial to maintain the right level of inventory levels so that there are minimum stock outs and maintenance can be done without any worry for parts.

Please read some articles on safety stock on below links.

<https://www.youtube.com/watch?v=iyG8r_SXedU>

http://web.mit.edu/2.810/www/files/readings/King\_SafetyStock.pdf

DNA HACKATHON

Safety Stock for Spare Parts for a manufacturing organization

Problem

The data provided here is for Spares consumption in a process manufacturing Company ABC. The maintenance department of ABC is the customer, who places Spares requests with Spare warehouse.  Maintenance department places orders based on the need and their need for spares does not fluctuate much. Sometimes maintenance department carries out shut down maintenance for individual production unit of ABC. During the shutdown period demand for spares shoots up very high. Shutdown period and frequency can vary from unit to unit. Ronaldo is the Data Scientist, who was fed up with paying football and decided to pursue his interest in Data Science and joined ABC. He is given the target to optimize inventories and define stocking levels for spares. Before he applies any model to identify right inventory levels, he is facing the challenge to correct the outliers in the data. These outliers can be of excess demands during shutdown period or erroneous transactions or return transactions, etc. So he approaches couple of maintenance engineers to understand outliers. Maintenance Engineers initially helped in identifying the monthly threshold values for each of the SKU but later on they could not help due to their busy engagements. Largely threshold value gives an indication that monthly demand cannot be more than threshold value under normal circumstances. So net net Ronaldo has been able to get the help of maintenance engineers to identify the threshold value for some 100 odd SKUs but for rest of the SKUs, he has to identify the threshold values.  Since he has made his career move from Football Field to Data Science very recently, so he is struggling to use the acquired skill to solve this case and has reached out to you to identify the right threshold value by applying data science. Data provided here is 5 years of historical data with summarized monthly demand.

Story does not end here; he has to identify the right Safety levels of individual parts/SKU so that the maintenance operations continue hassle free.  He has been given the target to maintain service level 95% for each part. You need to help Ronaldo to identify safety stock which can provide service level of 95%.

Data

* Column1 : SKU code
* Columns2-62 : Months starting from P61 in the past to P1 being the latest month
* Clolumn-63 : Threshold values for outliers. Any value beyond the threshold value to be treated as outlier
* Cloumn64-MLT: Mean Lead time in days. This is the lead time for procurement of parts. It represents the time taken from Purchase Order Placement to First goods receipt against the Purchase order
* Cloumn65-SDLT : This is standard deviation of the lead time in days