

“INVENTORY PLANNING OPTIMIZATION” THE CHALLENGES WITH SEGMENTING AND EXTRAPOLATING DEMAND

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1.0 Abstract:

Inventory Planning requires in-depth knowledge of DEMAND which is influenced by several internal and external factors. Several of these factors include seasonalities, trends, historical data, randomness, etc. Complexities in planning increase if there is variability in supply of raw materials and internal resources. There are several forecasting methods and models available and can be selectively applied. To increase the efficiency of the forecast it is important products/items are appropriately classified. There are a lot of ways inventory is classified in the industry. The focus in this paper is on how products classification can be optimized so that any forecasting model and/or methods may be applied.

Key words: Inventory Optimization, ABC-XYZ Analysis. Material/Item Forecast and Planning

1.1 Introduction

In any industry today inventory optimization is such a vital function. Excess and Shortage of inventory in all levels of the supply chain can affect the availability of products and/or services to consumers. Several monitoring systems and processes can be employed to check inventory imbalances to minimize the supply and demand dynamics. To simply these monitoring systems and process items/materials/products are classified into different groups and several different strategies needs to be applied appropriately so that it benefits the entire Supply Chain and not only individual entities of the Supply Chain. Several such categorization of items / materials / products are based on

1. Price
2. Value
3. Criticality

4. Availability
5. Movement
6. Predictability
7. Weight

Most commonly used analysis in the industry today is the ABC analysis which is based on the value of movement of materials. This analysis can be done very easily and is also very effective. Several other analysis like FSN, SDE, HML, XYZ etc are difficult to compute and have several inherent challenges. Some 2-Dimensional analysis of materials are also used for categorization of products like ABC-XYZ

1.2 Back ground to the study

In today's challenging business environment, companies are forced to handle more and more products. Companies are not only diversifying the product portfolios to increase organic growth but pressures from competition

and demands from the customer are forcing companies them to increase the range of products they can offer. So when companies handle more and more products, the optimization of inventory becomes very critical. Lot of matrices these days revolves around inventory. Infact even employee's salaries linked with their Performance Variables, proportionally varies with the targets related to Inventory

1.3 Need and importance

Every Industry depending upon the type of challenge will need to categorize the products because not all products are same. Management of inventory becomes easier when products are grouped based on their similarities. For warehousing, storage, distribution, planning, forecasting depending upon the type-of-need appropriate categorization may be applied. For example for warehousing, heavier items are stored close to the docks. Lighter items may be stored farthest from the docks. In this case the Inventory may be classified into HML. Similarly frequently used items know as Fast Moving items are stored in locations which are easily accessible and Slow movers are placed in other places. Therefore items are classified into FSN. For revenue and inventory optimization ABC classification is done which is based on value of transactions. Thus inventory categorization/classification needs to be done appropriately based on need.

1.4 Scope of the study

There are lot of ways inventory can be classified. The most commonly used classification in companies today is ABC

Analysis. Also this kind of classification may be used differently. In some cases like Storage, Working Capital Requirements, ABC it is applied for entire range of products which include Raw Materials, Semi-Finished Goods, Finished Goods etc. In some cases like Production Planning, Sales and Marketing, ABC is applied on Finished Goods. The scope of study is restricted to ABC Classification on FG

1.5 Data collection/ compilation

Sales data from a Plastic-OEM company dealing in Auto parts is being considered for this study.

1.6 Assumptions and limitations

The most popular Statistical Analysis used today in industry today is Pareto Analysis. As per the Pareto Principle, 80% of the revenue comes from 20% of the items. Based on various literatures and practical experience, it is evident that this is just a kind of approximation. Therefore when ABC classification is done the following percentages are applied. 80%, 95% and 100%.

1.7 Challenges in Product Categorizations:

The duration and periods of data analysis plays an important role. For different analysis the periods for analysis varies. To find out trends, seasonalities data analysis for extended may be required. For stock reduction, revenue analysis short-term data is required. Again there are no industry standards that define this for various analyses. Mostly in industry the periods considered are randomly decided based on convenience.

1.8 Observations: Impact of considering different Time Periods

For Inventory Planning, Optimization, forecasting etc the period of data analysis can have a large impact. Consider this ABC analysis from an OEM company.

	Active	% Diff	A	B	C
1 Month	76		7	20	49
2 Months	117	35%	8	23	86
3 Months	132	11%	10	24	98
4 Months	154	14%	12	25	117
5 Months	165	7%	14	26	125
6 Months	170	3%	15	25	130
7 Months	182	7%	15	26	141
8 Months	185	2%	15	26	144
9 Months	193	4%	15	26	152
12 Months	220	12%	18	29	173

The above data shows the number of active, A, B, and C items for different periods of data. Typically when you consider a 12-Month horizon, there are transactions for 220 items. But if you consider only 1-Month transactions, the number of items reduces to 76. This directly impacts the number of items classified as A, B and C. No. of A class items for a 12-Month period is 18 against 7 items for a 1-Month data. Also for both 12-Month and 1-Month data, A-Class items are less than 10% of Active items.

Meaning – Less than 10% of the items contribute for 80% of the Revenue. Therefore it becomes reasonable to understand what must be the logical rule to classify the items. In various industries it becomes a matter of convenience. The effort is to find out if there is a statistical methodology to define the Range of Period for which the classifications can be done. The analysis is done for A class items because the focus is always more on this category as their contribution to revenue is maximum (80%)

	Jan-13	Feb-13	Mar-13	Apr-13	May-13	Jun-13
A-1M	10	15	9	13	8	7
A-2M	13	14	14	13	12	8
A-3M	13	15	15	15	13	10
A-4M	12	15	17	16	15	12
A-5M	15	14	17	17	16	14
A-6M	16	17	16	17	16	15
A-7M	16	18	18	17	16	15
A-8M	18	18	19	18	16	15
A-9M	19	19	19	19	17	15
A-12M	21	21	21	21	20	18

The different column indicates the ending period for different Ranges of periods in the rows.

The above table shows the number of A-Class items for different Range of Periods for Six

Months. The row A-3M indicates the data 3 months. Jan-13, the three months data include, Nov-12, Dec-12 and Jan-13. For Feb-13 the three months data include Dec-12, Jan-13, and Feb-13 and so on.

Similarly the row A-6M indicates the data for 6 Months. Jan-13 the six months include Aug-12 to Jan-13, Feb-13 includes Sep-12 to Feb-13 and so on.

Row A-9M indicates the data for 9 Months. Jan-13 the nine months include May-12 to Jan-13, Feb-13 includes Jun-12 to Feb-13 and so on.

For data in the above table Statistical Data – Standard Deviation is obtained.

Range		Jun-13				
A1M		29.78%				
	Jan-13	Feb-13	Mar-13	Apr-13	May-13	Jun-13
A1M	34.25%	34.56%	23.44%	20.75%	24.36%	29.78%
A2M	16.75%	16.75%	13.13%	9.11%	6.88%	18.25%
A3M	19.78%	19.73%	17.47%	15.65%	14.63%	14.63%
A4M	16.30%	15.67%	12.80%	11.93%	11.61%	14.30%
A5M	10.69%	13.76%	10.72%	7.91%	7.38%	8.89%
A6M	10.10%	10.29%	9.33%	4.90%	3.16%	4.66%
A7M	8.75%	8.88%	6.09%	5.85%	5.73%	7.27%
A8M	6.26%	6.66%	4.37%	2.82%	5.51%	8.69%
A9M	5.96%	4.96%	4.29%	2.13%	4.37%	9.30%
A12M	5.44%	6.00%	4.77%	3.83%	1.96%	5.96%

A2M	18.25%
A3M	14.63%
A4M	14.30%
A5M	8.89%
A6M	4.66%
A7M	7.27%
A8M	8.69%
A9M	9.30%
A12M	5.96%

Here the Std. Dev for 6M data shows minimum variation for the number of items classified as “A”. Similar data has been compiled for other period as shown below.

Least SD is observed in different periods. It is difficult to conclude the most optimum period. P Statistic is obtained to test the significance of the data.

A6M VS A7M	A6M VS A8M	A6M VS A9M	A6M VS A12M
0.516	0.869	0.887	0.528

1.9 Findings of the study

Since these P-Values are greater than 0.05, it shows that the data for 6, 7, 8, 9 and 12 Months are not significantly different.

1.10 Role of optimum period planning

When optimized data is extrapolated for planning, Forecasting Errors can be minimized.

As shown earlier, the number of items for planning could range from 220 (12M) to 76 (1M). Extrapolation of data which is at extremes could lead to huge forecasting errors. Such errors can be minimized if the planning data is optimized before extrapolation.

1.11 Conclusion

Using the Significance Test we can conclude that the optimum period to be considered for analysis is 6 Months. Therefore 6 Month data analysis will be the most optimum period for which ABC Classification may be applied.

1.12 Scope for further research

The challenge for industry is how much of these statistical analysis can be done over time such classifications are required. Also in the above analysis data for 6 sets were considered. Does the significance change if P-Values are tested for additional sets of data?

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