01/30/2017

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Project C: Optimal Inventory Redistribution

Problem Introduction:

Problem Statement:

The goal is to investigate opportunities to maximize Fastenal's profits by using product rationalization and optimally redistributing existing inventory.

To rationalize products, one must identify trends in "Earns and Turns" performance. These trends exist within the value of purchased assets, time the asset sits in inventory, and the profit earned when the asset sells.

In addition to product rationalization, Fastenal's profits could be increased by optimizing the locations of existing inventory through redistribution. To successfully redistribute the inventory, one must use forecasted consumption trends alongside previously recorded inventory data and the fit-form-function attribute comparison. The possible costs of redistribution versus the asset cost must be kept in mind as well.

Methods:
First, we will address the task of finding relationships between inventory items. (using categories)

Secondly, we will forecast future consumption trends based on multiple variables such as branch location, time of year, item description, and previous inventory selling data.

Finally, we will combine the findings of the previous steps to formulate an optimal inventory redistribution plan, keeping in mind the possible cost of redistribution versus the asset cost.

We will utilize the following data tables in our analysis:

- *Product Table* - A table of the inventory items with their respective pricing information, categories, and general information
- *Hub Inventory Table* - A table of the stocked quantity of the inventory items for a single branch and multiple hubs with pricing and sales information
- *Branch Inventory Table* - A table of the stocked quantity of the inventory for multiple branches with pricing and sales information
- *4 Years Consumption Table* - A table of the sale information for multiple branches through the years 2013-2015 of Fastenal divided into monthly sales and annual

Currently, we are working on reorganizing the data and renaming the inventory information. This is to make the encrypted data we were given readable and prepared for analysis. Starting with product differentiation, we will relabel (using R) the IDs with numerical tags

“ID_number”, whilst keeping a parallel array containing the “gibberish” tags as a reference for renaming the IDs as they appear in the other data files.

Resources:

The Tables: Column Descriptions

Product Table :

blank	A column of unique integers for every row
INV_ITEM_ID	Unique identifier for every inventory item sold by Fastenal
CONCEPT	High level item grouping
CATEGORY_ID	Unique identifier for a group of categories assigned to products
CATEGORY_ID1	Unique identifier for a group of categories assigned to products
CATEGORY_ID2	Unique identifier for a group of categories assigned to products
CATEGORY_ID3	Unique identifier for a group of categories assigned to products
CATEGORY_ID4	Unique identifier for a group of categories assigned to products
WHSL_PRICE	Extended sale price of an item
STD_COST	Adjusted cost of an item for the company
COST_OF_GOODS	Cost of the asset to the company
ITEM_WEIGHT	Weight of the inventory item
STD_PKG_QTY	How many individual items per packaging unit
PRIVATE_LABEL_FLAG	‘Y’ if product is an Exclusive Brand, ‘N’ if it is not
CLASSED	Classed items are items stocked at a hub based on time of year. 1 signifies it is classed, 99 is unclassed.

Hub Inventory Table:

blank	A column of unique integers for every row

INV_DATE	Date inventory was taken on a given item. All dates are 12/1/2016
BRANCH_CODE	Unique identifier for a single Branch. All branches are “do~<<”
INV_ITEM_ID	Unique identifier for every inventory item sold by Fastenal
QTY_BASE	Current quantity on hand of an item
STD_COST_USD	Adjusted cost of an item for the company to buy in USD
STD_VALUE_USD	What Fasten sells an item for at retail in USD
CATEGORY_ID	Unique identifier for a group of categories assigned to products
WHSL_PRICE	Extended sale price of an item
COGS_COST_USD	“Cost of Goods” cost in USD for Fastenal
COGS_VALUE_USD	“Cost of Goods” cost in USD at retail
COST_FLAG	Unknown

Branch Inventory Table:

blank	A column of unique integers for every row
INV_DATE	Date inventory was taken on a given item. All dates are 12/1/2016
BRANCH_CODE	Unique identifier for a single Branch. Multiple branches in this file
INV_ITEM_ID	Unique identifier for every inventory item sold by Fastenal
QTY_BASE	Current quantity on hand of an item
STD_COST_USD	Adjusted cost of an item for the company to buy in USD
STD_VALUE_USD	What Fasten sells an item for at retail in USD
CATEGORY_ID	Unique identifier for a group of categories assigned to products
WHSL_PRICE	Extended sale price of an item
COGS_COST_USD	“Cost of Goods” cost in USD for Fastenal
COGS_VALUE_USD	“Cost of Goods” cost in USD at retail

COST_FLAG	Unknown

4 Years Consumption Table:

** Every month is recorded under* USAGE_MONTH *except for October, in which* USAGE *for the entire year is calculated*

blank	A column of unique integers for every row
INVOICE_DT	Date inventory was taken on a given item. Dates recorded on are 10/1/2013, 10/1/2014, 10/1/2015, 10/1/2016
BRANCH_CODE	Unique identifier for a single Branch. Multiple branches in this file
INV_ITEM_ID	Unique identifier for every inventory item sold by Fastenal
USAGE1	Quantity sold of the item in 2013
USAGE2	Quantity sold of the item in 2014
USAGE3	Quantity sold of the item in 2015
USAGE4	Quantity sold of the item in 2016
USAGE_MONTH_1	Quantity sold of the item for the month of January
USAGE_MONTH_2	Quantity sold of the item for the month of February
USAGE_MONTH_3	Quantity sold of the item for the month of March
USAGE_MONTH_4	Quantity sold of the item for the month of April
USAGE_MONTH_5	Quantity sold of the item for the month of May
USAGE_MONTH_6	Quantity sold of the item for the month of June
USAGE_MONTH_7	Quantity sold of the item for the month of July
USAGE_MONTH_8	Quantity sold of the item for the month of August
USAGE_MONTH_9	Quantity sold of the item for the month of September
USAGE_MONTH_11	Quantity sold of the item for the month of November
USAGE_MONTH_12	Quantity sold of the item for the month of December