b14all

TURNING
DATA INTO
INSIGHTS

INVENTORY MANAGEMENT

BACK ORDERS

Inventory Management

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Introduction

In a very competitive market with huge concerns about being efficient and customer awareness most of the companies try to find out some alternative ways to solve old problems that directly impact their business and the relation with the customers.

Fortunately, we have now the capacity and the tools to address many of these problems as we never had before.

Inventory Management

A company's inventory is one of its most valuable assets. In retail, manufacturing, food service and other inventory-intensive sectors, a company's inputs and finished products are the core of its business, and a shortage of inventory when and where it's needed can be extremely detrimental. At the same time, inventory can be thought of as a liability (if not in an accounting sense). A large inventory carries the risk of spoilage, theft, damage, or shifts in demand. Inventory must be insured, and if it is not sold in time it may have to be disposed of at clearance prices – or simply destroyed. (HAYES, 2019)

For these reasons, inventory management is important for businesses of any size. Knowing when to restock certain items, what amounts to purchase or produce, what price to pay – as well as when to sell and at what price – can easily become complex decisions. Small businesses will often keep track of stock manually and determine reorder points and quantities using Excel formulas. Larger businesses will use specialized enterprise resource planning (ERP) software. (HAYES, 2019)

Appropriate inventory management strategies vary depending on the industry. An oil depot can store large amounts of inventory for extended periods of time, allowing it to wait for demand to pick up. While storing oil is expensive and risky, there is no risk that the inventory will spoil or go out of style. For businesses dealing in perishable goods or products for which demand is extremely time-sensitive sitting on inventory is not an option and misjudging the timing or quantities of orders can be costly. (HAYES, 2019)

For companies with complex supply chains and manufacturing processes, balancing the risks of inventory gluts and shortages is especially difficult. To achieve these balances, firms have developed two major methods for inventory management: just-in-time and materials requirement planning. (HAYES, 2019)

Just-in-time (JIT) manufacturing originated in Japan in the 1960s and 1970s. The method allows companies to save significant amounts of money and reduce waste by keeping only the inventory they need to produce and sell products. This approach reduces storage and insurance costs, as well as the cost of liquidating or discarding excess inventory. JIT inventory management can be risky. If demand unexpectedly spikes, the manufacturer may not be able to source the inventory it needs to meet that demand, damaging its reputation with customers and driving business towards competitors. Even the smallest delays can be problematic; if a key input does not arrive "just in time," a bottleneck can result. (HAYES, 2019)

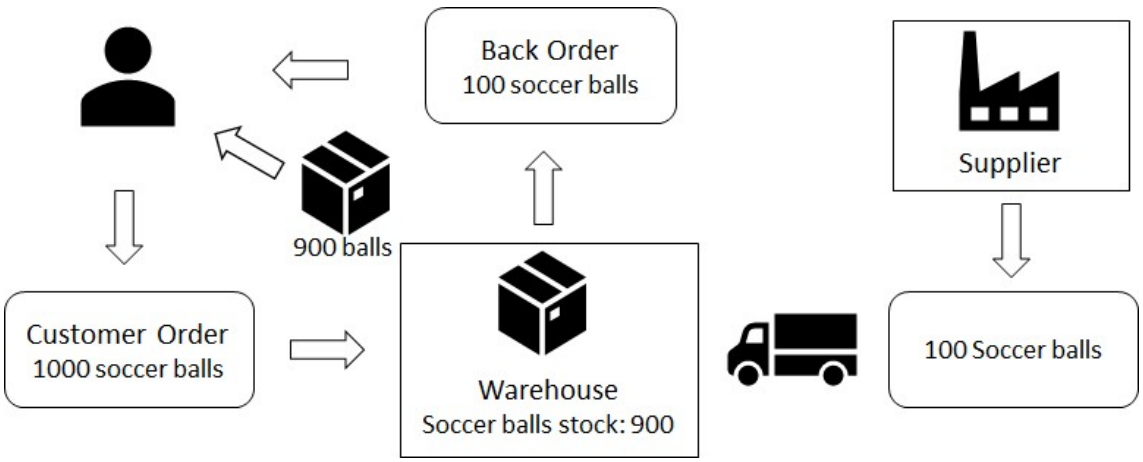
Material requirement planning (MRP) is a system for calculating the materials and components needed to manufacture a product. It consists of three primary steps: taking inventory of the materials and components on hand, identifying which additional ones are needed and then scheduling their production or purchase. It can be a more reliable method to keep the inventory in a good shape but on the other hand can lead to some hard issues if the demand changes quickly. (Rouse, n.d.)

In terms of keeping a balance of stock versus Both methods are quite affected by a common issue: “the stock-out”. Sometimes when a company makes an order for a good, a company or store may have run out of stock in its inventory. This is called a “stock-out”. (HAYES, 2019)

What are Back Orders

One way to deal with "stock-out" is to use Back Orders. A company who has run out of the demanded product but has re-ordered the goods would promise its customers that it would ship the goods when they become available. A customer who is willing to wait for some time until the company has restocked the merchandise, would have to place a Back Order. A Back Order only exists if customers are willing to wait for the order. (Wei, n.d.)

How it works? Let's assume that a customer purchases 1000 soccer balls from a dealer. The retailer has 900 on hand to ship. He must wait for the factory to make the rest, which could take several days. The 100 missing soccer balls are Back Ordered, and the customer will receive them later. (Team, 2017)



How they affect the business

Companies have to walk a fine line in managing their Back Orders. While consistently high levels of Back Orders indicate healthy demand for a company's product or service, there is also a risk that customers will cancel their orders if the waiting period for delivery is too long. Nothing guarantees that the customers will keep their orders. This can also generate a bad will from the customer and we all known how the "word of mouth" can be harmful for a company reputation. Companies take several years to build a reputation in the market that can quickly vanish with rumors or complaints, mainly with the social networks hype that we are going through. (HAYES, 2019)

The Challenge

But how can we avoid falling into this trap? The solution consists mainly on planning. When planning out the supply of your products or materials for a backorder focus on the top and hard to get products. It may be less complex to invest more heavily on low dollar items, but the fact that it is easier means that there will be more competition. Typically, the hardest to deliver deals will provide more profit and recognition. So, spend more time on planning them. To plan better we can try to predict the existence of Back Orders and act in conformity before it happens. (Team, 2017)

The goal of this challenge is to find and compare the best approaches to better predict the occurrence of a Back Order for products.

For this, given the confidentiality of our company's data, we have selected a similar public data set, that can be used to do this kind of analysis.

The data file contains the historical data for the 8 weeks prior to the week we are trying to predict. The data were taken as weekly snapshots at the start of each week. The target (or response) is the *went_on_backorder* variable. To model and predict the target, we'll use the other features, which include (Kaggle, n.d.):

- sku - Random ID for the product
- national_inv - Current inventory level for the part
- lead_time - Transit time for product (if available)
- in_transit_qty - Amount of product in transit from source
- forecast_3_month - Forecast sales for the next 3 months
- forecast_6_month - Forecast sales for the next 6 months
- forecast_9_month - Forecast sales for the next 9 months
- sales_1_month - Sales quantity for the prior 1 month time period
- sales_3_month - Sales quantity for the prior 3 month time period
- sales_6_month - Sales quantity for the prior 6 month time period
- sales_9_month - Sales quantity for the prior 9 month time period
- min_bank - Minimum recommend amount to stock
- potential_issue - Source issue for part identified
- pieces_past_due - Parts overdue from source
- perf_6_month_avg - Source performance for prior 6 month period
- perf_12_month_avg - Source performance for prior 12 month period

- local_bo_qty - Amount of stock orders overdue
- deck_risk - Part risk flag
- oe_constraint - Part risk flag
- ppap_risk - Part risk flag
- stop_auto_buy - Part risk flag
- rev_stop - Part risk flag
- went_on_backorder - Product actually went on backorder. This is the target value.

Technologies

No limitations. Can be R, Python for data understanding, data preparation, feature engineering and modelling.

No limitations. Can be Tableau, PowerBI, Qlikview for data exploration, visualization, presentation of pertinent results

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