

ORDER POWER!

Time Series Forecasting Program Specifications

The following section describes the programming specifications and intricacies encountered with a time series forecasting analysis.

History Extraction Program - FO01001

This program reads through the shipped orders history file and compiles the history for an item during the period covered by the report. Shared inventories are figured into this procedure.

Procedure

Vendor Selection

The Vendor Master file is read and the vendors with the proper frequency codes are selected. Only active vendors are selected; deleted vendor records are excluded.

Item Selection

All items supplied by the selected vendors and assigned the proper buyer code(s) will be selected for forecasting. When “blank” frequency codes are requested, ***ORDER POWER!*** selects only items that do not have a designated *primary vendor*.

Kit to stock parent items, *kit to ship* and assortment component items, and *shipped* continuity items can be forecasted. However, *future* continuity shipments are not considered in the forecast report. Drop shipments, phase outs, non-salable, and non-stock items are also excluded from the forecasting process.

The item quantity for the *forecasted* item are totaled for all orders shipped from the selected warehouse(s). The total is added to the appropriate work field (or “bucket”). These “buckets” are defined by date range; therefore, the item quantity is added to the work field or date range “bucket” into which the shipped order date falls.

All quantities are converted to *selling units of measure* (U/M).

Print Time Series Forecasting Report

Procedure

This program adds up the historical and forecasted values for items selected by the user and generates the Time Series Forecasting Report (FO01001). One detail line is printed for each item. New headings are printed for each new vendor and buyer code.

The operator defines the spread the historical and forecasted values across the columns on the report to best meet the needs for the current report. For example, the analyst may want to see the historical information in six week increments, but wants to view the forecasted values in one week increments. This print program allows for this flexibility. *Refer back to the discussion on Time Series Forecasting panel 2.*

Determine Weekly Seasonality Factors - FO01502

Procedure

This program converts the selected monthly seasonality factors defined for each seasonality code, into weekly factors.

Each monthly factor is multiplied by “.12”. This process assigns a value of 1 to a perfectly average month. Previously, the twelve monthly seasonality factors total 100; following the conversion, they now total 12.

Next, a factor is assigned to each week. For example, should a week fall entirely within one month, the corresponding monthly factor is assigned to the week. When a week overlaps two months, the two monthly factors are weighed appropriately.

Finally, each weekly factor is divided to insure that when added together, all weekly factors total 52.

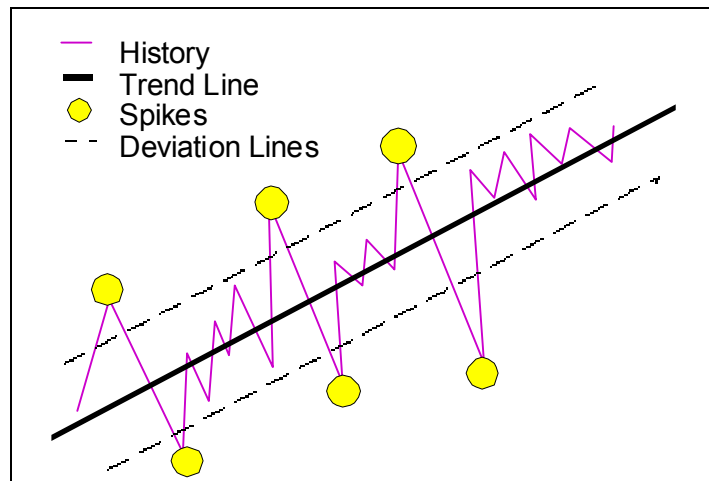
Determine the Forecast Based on the Historical Values - FO01503

Procedure

Deseasonalize history by dividing the shipped order totals (“buckets”) by the seasonality factors.

Determine a trend line for the deseasonalized data. A separate program is called to perform this task.

Smooth (average) out spikes in data that are more than two standard deviations from the trend line.



Determine the new trend line based on the smoothed or averaged data.

Extrapolate the trend line and multiply the seasonality factors back in to determine the forecast.

Determine Trend Line and Average Deviation - FO01504

This program performs the calculations required produce trend lines and deviation. Coefficients for A and B are

$$A = \frac{\sum t^2 s - \sum t s^2}{N (\sum t^2 - (\sum t)^2)}$$

$$B = \frac{N \sum s^2 - (\sum s)^2}{N (\sum t^2 - (\sum t)^2)}$$

calculated based on the common Linear Regression Formula. The equations will be defined below:

- where: *t* is the time period in number of weeks
- s* is the shipped quantity
- N* is the number of history weeks used

The weeks are numbered from 1 - 208 where week 1 is the oldest history possible (3 years ago), week 157 is the current week beginning with today's date, and week 208 is a week beginning 51 weeks from now. Therefore, *a maximum of three years of history can be used, and a maximum of one year can be forecasted.*

Values A and B are used to determine the trend line and the average deviation from the trend line.

This program checks to see if the last four weeks of historical data diverge further and further from the trend line. Should this be found, an error message will be displayed.

Determine Amount to Buy - FO01505

This program will calculate how much of an item to buy based on the forecast, quantity available, and vendor policies.

Procedure

1. Based on Run Out / Lead Time

Buy all items that will run out before new stock can be received by the vendor (IE all items whose run out time is less than the vendor lead time).

Increment the number purchasing units by one until the run out is greater than or equal to the lead time. Stop incrementing the purchasing units when the run out equals or exceeds one year.

2. Vendor Policy

Once all items have a run out value that equals to or exceeds the lead time, the purchasing units will continue to be incremented as required by the vendor policy specifications.

For example, policy requires that a minimum of \$3000 be purchased for vendor V1, but only \$2000 has currently been forecasted. **ORDER POWER!** determines which item will run out first, increments the purchasing units by one for that item, then recalculates the new run out value. Then one unit of the next item scheduled to run out is purchased and the run out value recalculated, and so on. The system continues to "buy" items from vendor V1 until at least \$3000 have been purchased or all items are scheduled to run out in more than one year's time.

An item's run out value is determined in a separate program.

Determine Run Out (in Days) - FO01506

This program determines how many days are left before an item will run out of stock. The run out figure is based on the amount currently available and how much of the item is forecasted for sale.

Procedure

First, the *daily forecasted demand* is calculated by dividing the forecasted weekly sales by seven (days in a week).

Next, the *available quantity* is determined by totaling the quantities on hand in all warehouse locations and adding them to the quantity on purchase orders. The quantity on customer order and minimum stock levels are subtracted from this total as these values are not available; they have already been committed or must remain in inventory.

Finally, the amount to "buy" as determined in the previous program is added, totaling the available item quantity.

Finally, the number of *run out days* is calculated by dividing the quantity available by the daily forecasted demand.