Supply Chain Optimization

MBA-550 Weeks 4-6

Chapter 8 Six Sigma

Chapter 13 - Forecasting - basis of long run corporate planning

(Pg 3) try to find the best forecasting method possible.
2 or 3 methods for common sense view.
can have control over independent demand (increased sales)
if at excess capacity ⇒ accept demand.

(Pg 4) time series analysis - past data to predict future demand.

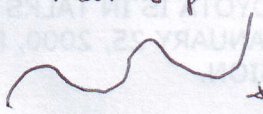
causal forecasting - linear regression technique
assumes demand is related to underlying factors in environment.

(Pg 5) Kinds of forecasting (Pg 5)

① Qualitative
② time series analysis
③ Causal

X-11 - Shiskin Analysis (3 years of history)
decomposes time series into seasonals, trends & irregular

(Pg 6) with all known causes of demand we subtract from total demand.
(average, trend, seasonal, cyclical, & auto correlative)
trend lines are adjusted for causes.
linear trend is continuous relationship —



S curve
trend slows & accelerates

Mathematics of curves are shown ⇒ solving values for future time periods is easy.

(Pg 8) ① Qualitative
Market research
Historical Analogy - classify products as complimentary, substitutable, competetive, function of income (elastic, inelastic)

(Pg 10) ② Time Series Analysis
Delphi - conceals opinions
attempt to predict the future, based on past data.
(relative to context) short term - 3 months (consumer reponse, random variation)
medium term - 3 months to 2 years (good for seasonal effects)
Long Term - greater than 2 years (general trends, turning points)

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How to decide on which forecast to use.

1) Time horizon to forecast
2) Data availability
3) Accuracy required
4) size of forecasting budget
5) Availability of qualified personnel.

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Simple Moving Average - if steady demand for product (no ups or downs) (not for seasonal)

(equal weights to each component) if there is a trend in the data, it lags the trend (smooths it, not accurate analysis)

$F_t = \frac{\text{sum of periods}}{n \text{ (\# of periods)}}$

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Weighted Moving Average - allows any weights to be placed on each component.

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Need large amounts of data for simple ad weighted moving averages. (same with regression analysis)

For deciding on weights; which periods are more appropriate to future period?

Exponential Smoothing - (each increments in the past is decreased by $(1-a)$.

"importance of data becomes less relevant as the past becomes more distant" (diminishingly important)

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* Most common forecasting technique → for ordering inventory (part of all computerized forecasting programs)

Accurate, Easy, minimum computation

3 pieces of data are needed. 1) recent forecast 2) Actual demand that occured in that forecast

3) Smoothing constant alpha (a) (has to do with if actual forecast response rate (greater alpha if experiencing growth)

Changing the alpha is called adaptive forecasting.

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Pg 17 can also add a trend adjustment to correct the "Exponentially smoothed forecasts"

Smoothing constant delta (d)

"Forecast including the trend"

Two smoothing constants (a) (d)

Tracking alpha (α) = actual error (difference between forecast and actual) AKA (residuals) / absolute error (all positive, uses absolute error)

Alpha changes from period to period.

If forecast is within confidence limits, it's not an error

All forecasts contain error

Pg 21 Tracking Signal - indicates whether forecast is in pace with changes in demand.

= # of Mean absolute deviations that forecast value is above or below actual occurance

Tracking Signal = Sum of forecast deviations / average error in the forecasts using absolute values (all positive) (MAD)

Now Standard deviation the preferred calculation.

MAD has made a comeback though - used to forecast errors.

Pg 24 Linear Regression Analysis to predict one variable given another. (generally from observed data)

assumes "linearity" (AKA correlation (AKA) related.

Pg 25 Least Squares Method - tries to fit the line to the data that minimizes each data point to a line (corresponding point on the line)

can use the computed equation to forecast ⟹

$\hat{Y}_t = a_t + b_t t$

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(pg 29) ## Decomposition of Time Series

identifying ad separating time series into components.

Two types of seasonal variation = additive ad multiplicative.

① additive - seasonal amount is constant (no matter the trend)

② multiplicative - trend is multiplied by seasonal factors. ↑ (most common)

Seasonal factor - correction time needed to adjust for season.

(pg 33) Decomposition of time series → finding components

After indexes are calculated for seasons and cycles (average)

then project the trend using the indexes

(pg 34) ## Deseasonalization of demand - original data / seasonal factor

ex. for ** same quarters for 3 year period (average) then general average for all 12 quarters.

then → least squares regression line (to develop an equation for the trend line (y)

X = quarter

Y = demand

(pg 42) ## Collaborative Planning, Forecasting ad Replenishment (CPFR)

to synchronize forecasts, production & replenishment plans

(shared web server)