BSTA 325 – TEST 3 FORMULA SHEET

Forecasting

Moving Average

$$k\text{- period moving average } = \sum (\text{actual value in previous } k \text{ periods})/k$$

Weighted Moving Average

$$k\text{-period weighted moving average } = \frac{\sum_i^k (\text{weight for period } i) \times (\text{Actual value in period } i)}{\sum_i^k (\text{weights})}$$

Exponential Smoothing

$$F_{t+1} = F_t + \alpha\,(A_t - F_t) \quad \text{or} \quad F_{t+1} = \alpha A_t + (1-\alpha)F_t$$

where A_t = actual value in period t , F_t = forecast for period t

F_{t+1} = forecast for period t +1, α = smoothing constant value ($0 \le \alpha \le 1$)

$$MAD = \sum_{t=1}^{T} |\text{ forecast error } | / T \qquad MAPE = 100\sum_{t=1}^{T} \left(|\text{ forecast error } | / A_t\right)/T$$

Centred Average:

$$\text{Centred average for quarter t} = [0.5\times\text{sales in quarter } t-2 + \text{sales in quarter } t-1 + \\ + \text{sales in quarter } t + \text{sales in quarter } t+1 + 0.5\times\text{sales in quarter } t+2]/4$$

Seasonal Ratio:

$$\text{Seasonal Ratio} = \frac{\text{Actual value}}{\text{Centred moving average}}$$

Unnormalized Seasonal Index:

$$\text{Unnormalized Seasonal Index for quarter t} = \text{Average of all Seasonal Ratios for quarter t}$$

Normalized Seasonal Index:

Normalized Seasonal Index for quarter t = Unnormalized Seasonal Index for quarter t / Sum of all Unnormalized Seasonal Indices

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Multiple Regression

$\hat{y} = b_0 + b_1 x_1 + b_2 x_2 + ... + b_k x_k$ (general form of the estimate multiple regression equation)
n = sample size, k = number of independent (x) variables

ANOVA				
	df	**SS**	**MS**	**F**
Regression	**k**	**SSR**	**MSR = SSR/k**	**MSR/MSE**
Residual (Error)	**n-k-1**	**SSE**	**MSE = SSE/(n-k-1)**	
Total	**n-1**	**SST**		

Coefficient of Determination (R^2) = $\frac{\text{explained variation}}{\text{total variation}}$ or $\frac{SSR}{SST}$

$$\text{Adjusted } R^2 = 1 - \frac{(n-1)}{(n-(k+1))}(1-R^2)$$

Standard Error of Estimate (s_e) $s_e = \sqrt{\frac{SSE}{n-k-1}}$ or $s_e = \sqrt{\frac{\sum (y-\hat{y})^2}{n-k-1}}$

Total Variation $SST = \sum_{i=1}^{n} (y_i - \bar{y})^2$

Explained Variation $SSR = \sum_{i=1}^{n} (\hat{y}_i - \bar{y})^2$

Unexplained Variation $SSE = \sum_{i=1}^{n} (y_i - \hat{y}_i)^2$

where $\hat{y}$ = predicted y value and y = actual y value

$$SSR + SSE = SST$$

$$t\text{-}stat = \frac{regression\ coefficient\ (b_i)}{standard\ error\ of\ b_i}$$

Confidence Limits = regression coefficient (b_i) ± standard error of $b_i \times t_{\alpha/2}$ (df = n-k-1)

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