Autocorelation test (Two tailed test)

Steps: S_1: Setting up of hypothesis

H_0: $\rho_{im} = 0$ => r.n's are independent

H_1: $\rho_{im} \neq 0$ => r.n's are dependent

S_2: Find i & m

where i is starting number and m is the length of gap.

S_2: Calculate M using i, m & N
where N is total numbers in the sequence.

$$i + (M+1)m \leq N$$

integer

Choose Maximum value of M

Eg. $M \leq \frac{27}{5}$ Here M will be 5

S_4: Calculate ρ & σ

$$\rho_{im} = \frac{1}{M+1}\left[\sum_{k=0}^{M} R_{i+km} \times R_{i+(k+1)m}\right] - 0.25$$

$\sigma_{im} = \sqrt{\frac{13M+7}{12(M+1)}}$

S_5 Calculate $Z_{calc} = \frac{\bar{x} - \mu}{\sigma}$

S_6. Find $Z_{tab} = Z_{\alpha/2}$

S_7 Compare Z_{calc} & Z_{tab}

To accept or reject H_0

$-Z_{\alpha/2} \leq Z_{calc} \leq Z_{\alpha/2}$

Numerical 1: Consider a sequence of 30 nos as given below. Test Wether the 3rd 8th & 13th numbers in the sequence are auto correlated with 80% confidence.

0.12, 0.01, 0.23, 0.28, 0.89, 0.31
0.64, 0.28, 0.83, 0.93, 0.99, 0.15
0.33, 0.35, 0.91, 0.41, 0.60, 0.27
0.75, 0.88, 0.68, 0.49, 0.05, 0.43
0.95, 0.8, 0.19, 0.36, 0.69, 0.87

Numerical 2 Autocorrelation Test

0.19, 0.16, 0.82, 0.63, 0.04,
0.16, 0.30, 0.22, 0.88, 0.48,
0.29, 0.56, 0.44, 0.05, 0.81,
0.38, 0.59, 0.37, 0.71, 0.43,
0.44, 0.45, 0.57, 0.99, 0.20, 0.14,
0.64, 0.50, 0.73, 0.15, 0.02,
0.49, 0.38, 0.24, 0.90, 0.74,
0.41, 0.09, 0.80, 0.42, 0.11, 0.29,
0.77, 0.08, 0.69, 0.48, 0.39,
0.18, 0.21, 0.98 ($\alpha = 0.05$)

Test nos at position 2nd, 7th 12th are autocorrelated.

Date

$i = 2 \qquad m = 5$

$i + (M+1)m \leq N$

$(M+1)5 \leq 48$

$5M + 5 \leq 48$

$5M \leq 43$

$\therefore M \leq \frac{43}{5}$

$\therefore M = 8$

$$\hat{\rho}_{im} = \rho_{25} = \frac{1}{9}\left[\sum_{k=0}^{M} R_{i+km} R_{i+(k+1)m}\right] - 0.25$$

$$= \frac{1}{9}\left[R_2 R_7 + R_7 R_{12} + R_{12} R_{17} + R_{17} R_{22} + R_{22} R_{27} + R_{27} R_{32} + R_{32} R_{37} + R_{37} R_{42} + R_{42} R_{47}\right] - 0.25$$

$$= \frac{1}{9}\left[0.16 * 0.3 + 0.3 \times 0.56 + 0.56 \times 0.59 + 0.59 * 0.45 + 0.45 \times 0.64 + 0.64 * 0.49 + 0.49 * 0.41 + 0.41 * 0.29 + 0.29 * 0.39\right] = 0.14869 - 0.25$$

$$= -0.10130875$$

Date

$\hat{\sigma}_{25} = \sqrt{\frac{13M+7}{12(M+1)}} = 0.092796$

$Z = \frac{S_{25}}{\hat{\sigma}_{25}} = \frac{0.10130875}{0.092796009155}$

$= 0.10973$

$= -1.0385 \quad -0.035$

$= -1.03851$