Time series plot:

# ACF:



Nonstationary: Fail to die 🡪 Take the difference 🡪 ARIMA(p,d,q)

PACF:

# Transformation:



Rounded value is 0.5 🡪 Transformation:

MTB > Let 'sqrt(W4)' = SQRT('W4')

MTB > TSPlot 'sqrt(W4)';

SUBC> Symbol;

SUBC> Connect.



Have the same shape as the time series of the original data 🡪 Transformation is not necessary.

Applying the model: ARIMA(4,1,0) with seasonal of AR(2).

# Plots of the residuals:



Approximately normal with mean zero.





From the ACF and the PACF of the residuals 🡪 white noise.

**ARIMA Model: W4**

Estimates at each iteration

Iteration SSE Parameters

 0 1098560 0.100 0.100 0.100 0.100 0.100 0.100

 1 917877 -0.050 0.011 0.027 0.060 0.054 0.057

 2 780004 -0.200 -0.079 -0.045 0.019 -0.000 0.004

 3 684730 -0.350 -0.170 -0.117 -0.023 -0.062 -0.057

 4 631972 -0.500 -0.263 -0.188 -0.067 -0.130 -0.128

 5 620525 -0.601 -0.334 -0.234 -0.100 -0.177 -0.185

 6 620412 -0.604 -0.343 -0.237 -0.103 -0.179 -0.193

 7 620409 -0.604 -0.344 -0.237 -0.103 -0.180 -0.194

 8 620409 -0.604 -0.344 -0.237 -0.104 -0.181 -0.194

 9 620409 -0.604 -0.344 -0.237 -0.104 -0.181 -0.194

Relative change in each estimate less than 0.0010

Final Estimates of Parameters

Type Coef SE Coef T P

AR 1 -0.6041 0.0450 -13.41 0.000

AR 2 -0.3441 0.0515 -6.68 0.000

AR 3 -0.2371 0.0514 -4.61 0.000

AR 4 -0.1035 0.0450 -2.30 0.022

SAR 12 -0.1806 0.0448 -4.03 0.000

SAR 24 -0.1944 0.0449 -4.33 0.000

Differencing: 1 regular difference

Number of observations: Original series 500, after differencing 499

Residuals: SS = 619177 (backforecasts excluded)

 MS = 1256 DF = 493

Modified Box-Pierce (Ljung-Box) Chi-Square statistic

Lag 12 24 36 48

Chi-Square 11.8 29.9 45.4 61.4

DF 6 18 30 42

P-Value 0.066 0.039 0.036 0.027

# The model:

$$W\_{t}=(1-0.6041B-0.3441B^{2}-0.2371B^{3}-0.1035B^{4})Z\_{t}$$