Time Series Demo (ACF, PACF, Tests of WN)

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Demo or Plots in Time Series

- Data: SOLARPV
  - Weekly data of solar power generated in SAS campus
  - EDT: date of Saturday ending the measurement week
  - **kW_Gen**: average daily solar electricity production in the week in kilowatt hours
  - Cloud_Cover: average daily estimated cloud cover in the week, scaled 0-10
  - Cosval: a discretized cosine wave starting at the summer solstice, with a cycle of one year
- Code: Program1_ARIMA Models
- Plan: Check series autocorrelations, carry out test for white noise

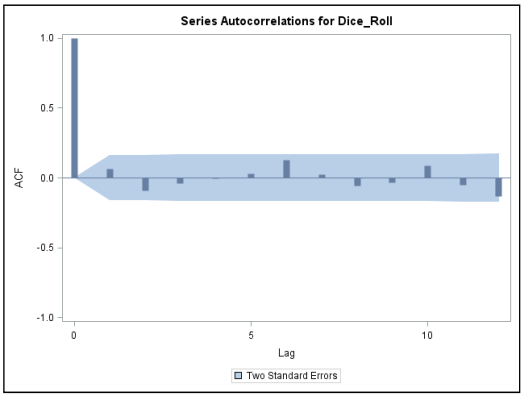
```
LIBNAME COURSE 'H:\DATA\MKTG6413';
/* Weekly Solar Power generated data from SAS */
Ods graphics on/imagemap=on;
Title 'Generating plots on weekly solar power data';
Proc Timeseries data=course.solarpv seasonality=52 Plots=(series acf pacf wn);
          id EDT interval=week;
          var kW_gen;
Run;
ods graphics off;
```

2

Recall: A White Noise Series

A white noise series has the following characteristics:

- varies randomly around its mean
- has no systematic variation
- consists of only random variation
- has constant variance



The Ljung-Box Chi-Square Test for White Noise

- A *white noise* time series is a Gaussian (normal, bell-shaped) time series with a mean of zero and a positive fixed variance in which all observations are independent of each other.
- The null hypothesis is that the series is white noise, and the alternative hypothesis is that one or more autocorrelations up to lag *m* are not zero.

  H_0: The series is white noise.

  H_1: The series is ***not*** white noise.

- **Note:** The Ljung-Box test can be applied to the original series or to the residuals after you fit a model.

The Ljung-Box Chi-Square Test for White Noise

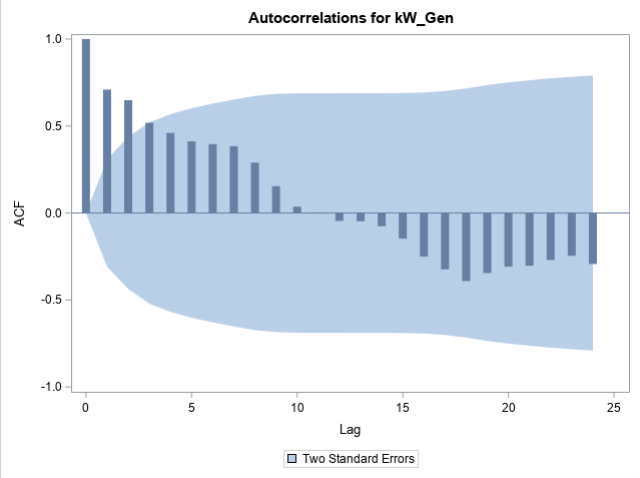
White Noise Series

Autocorrelation Check for White Noise									
To Lag	Chi-Square	DF	Pr > ChiSq	Autocorrelations					
6	5.00	6	0.5436	0.065	-0.095	-0.038	-0.004	0.028	0.129
12	10.39	12	0.5821	0.026	-0.060	-0.033	0.087	-0.054	-0.131

Autocorrelated Series

Autocorrelation Check for White Noise									
To Lag	Chi-Square	DF	Pr > ChiSq	Autocorrelations					
6	121.35	6	<.0001	0.804	0.750	0.652	0.608	0.546	0.509
12	147.33	12	<.0001	0.477	0.384	0.265	0.158	0.095	0.027

Output From SAS Code: Program1_ARIMA Models



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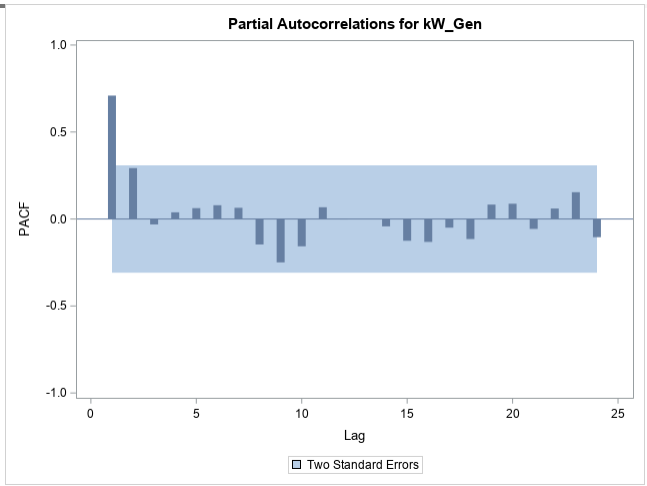
Output From SAS Code: Program1_ARIMA Models (Contd.)



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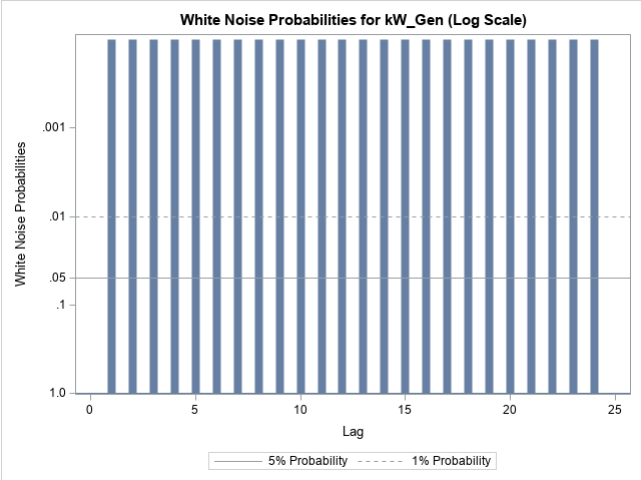
Output From SAS Code: Program1_ARIMA Models (Cond.)



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