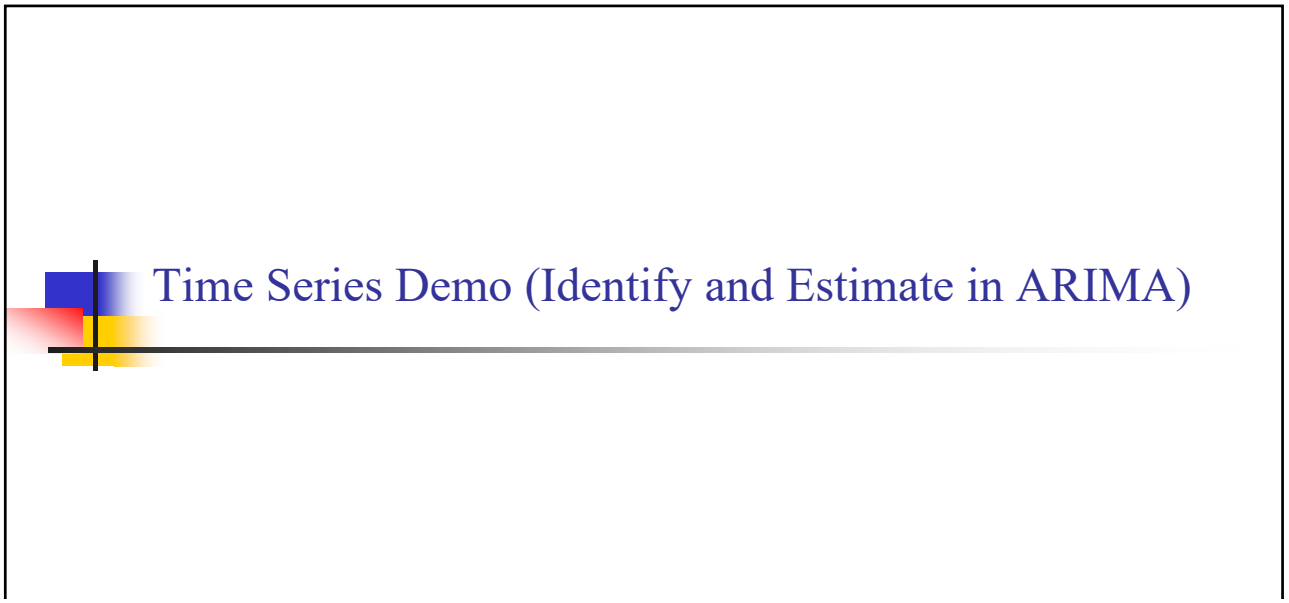


1

Forecasting Using Statistical Models

Box-Jenkins Modeling Methodology

- IDENTIFY
  - Estimate and evaluate diagnostic functions.
  - Diagnose trend and seasonal components.
  - Select input variables and determine a dynamic relationship with the target variable.
- ESTIMATE
  - Derive estimates for model parameters.
  - Evaluate estimates and goodness-of-fit statistics.
- FORECAST
  - Derive forecasts of deterministic inputs.
  - Predict non-deterministic inputs.
  - Forecast the target variable.

2

sas

IDENTIFY in ARIMA

```
/* ARIMA models via PROC ARIMA*/
/* Identify step to figure out what models to use */
Ods graphics on/imagemap=on;
proc ARIMA data=COURSE.Solarpv
plots(unpack)=series(all);
identify var=kW_Gen nlags=12;
run;
ods graphics off;
```

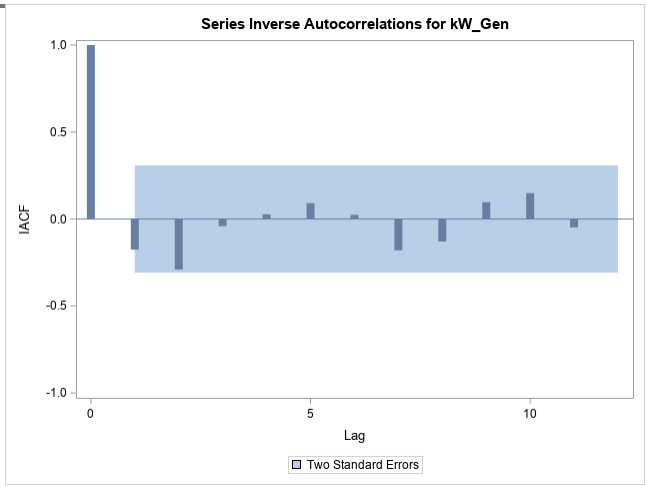
Test of White Noise

Name of Variable = kW_Gen	
Mean of Working Series	0.511078
Standard Deviation	0.179364
Number of Observations	42

Autocorrelation Check for White Noise									
To Lag	Chi-Square	DF	Pr > ChiSq	Autocorrelations					
6	81.65	6	<.0001	0.709	0.648	0.519	0.460	0.412	0.396
12	95.53	12	<.0001	0.384	0.290	0.154	0.036	0.003	-0.046

4

IACF (Inverse Auto Correlation Function)



Estimate in ARIMA

```
/* Identify and Then Estimate to Compare AR(1), MA(1) and ARMA(1,1) Model */
*/Ods graphics on/imagemap=on;
Ods graphics on/imagemap=on;
Title 'Estimating Multiple ARMA models on weekly solar power data';
proc ARIMA data=COURSE.Solarpv plots(only)= residual(corr normal);
identify var=kW_Gen nlags=12;
estimate p=1 method= ML;
estimate q=1 method= ML;
estimate p=1 q=1 method= ML;
run;
*/ods graphics off;
```

6

Output from ARIMA Estimate

Name of Variable = kW_Gen	
Mean of Working Series	0.511078
Standard Deviation	0.179364
Number of Observations	42

Autocorrelation Check for White Noise

To Lag	Chi-Square	DF	Pr > ChiSq	Autocorrelations					
6	81.65	6	<.0001	0.709	0.648	0.519	0.460	0.412	0.396
12	95.53	12	<.0001	0.384	0.290	0.154	0.036	0.003	-0.046

Maximum Likelihood Estimation

Parameter	Estimate	Standard Error	t Value	Approx Pr > |t|	Lag
MU	0.52019	0.06309	8.25	<.0001	0
AR1,1	0.70389	0.11038	6.38	<.0001	1

Constant Estimate	0.154036
Variance Estimate	0.016529
Std Error Estimate	0.128564
AIC	-50.4857
SBC	-47.0103
Number of Residuals	42

Correlations of Parameter Estimates

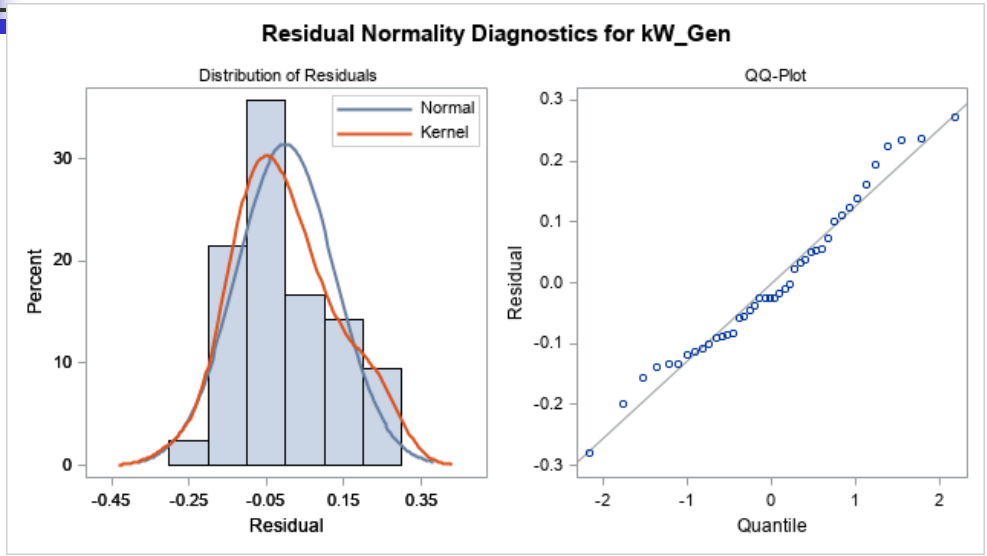
Parameter	MU	AR1,1
MU	1.000	0.055
AR1,1	0.055	1.000

Autocorrelation Check of Residuals

To Lag	Chi-Square	DF	Pr > ChiSq	Autocorrelations					
6	4.04	5	0.5430	-0.187	0.197	0.011	0.070	0.024	0.089
12	7.81	11	0.7301	0.221	0.090	0.009	-0.103	0.023	-0.039
18	13.25	17	0.7193	0.024	0.071	-0.000	-0.103	-0.027	-0.235
24	15.41	23	0.8792	-0.020	-0.010	-0.066	-0.077	0.043	-0.099

7

Output from ARIMA Estimate (contd.)



8