P507 Autocorrelation Example - U.S. Import Data

The REG Procedure
Model: MODEL1
Dependent Variable: import

Number of Observations Read	21
Number of Observations Used	21

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	413604	137868	724.62	<.0001
Error	17	3234.46160	190.26245		
Corrected Total	20	416838			

Root MSE	13.79357	R-Square	0.9922
Dependent Mean	384.72381	Adj R-Sq	0.9909
Coeff Var	3.58532		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	-264.25625	22.81227	-11.58	<.0001
cons	1	0.46686	0.04693	9.95	<.0001
unemp	1	-19.39043	2.38640	-8.13	<.0001
tax	1	-0.28691	0.14917	-1.92	0.0713

P507 Autocorrelation Example - U.S. Import Data

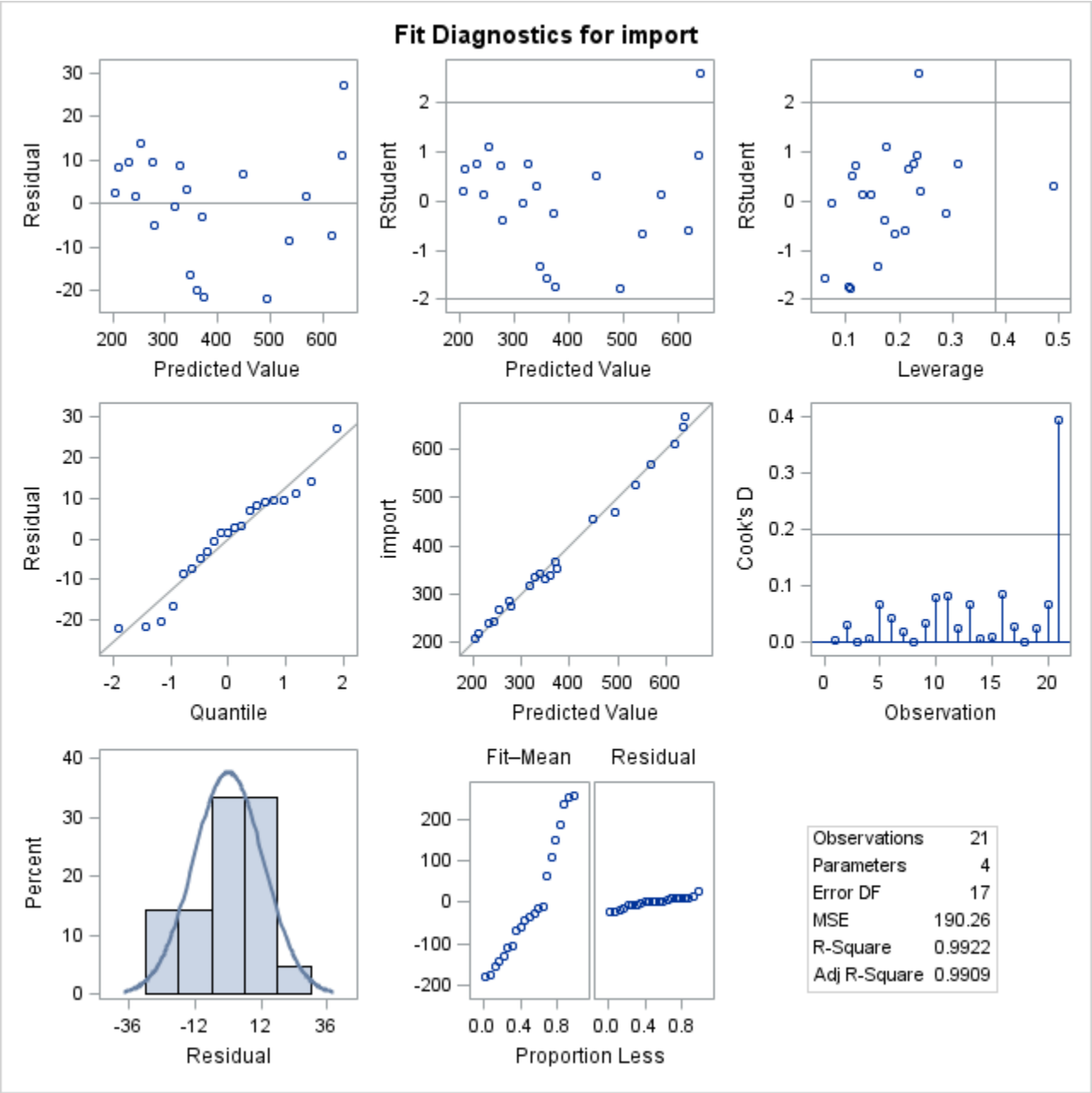
The REG Procedure
Model: MODEL1
Dependent Variable: import

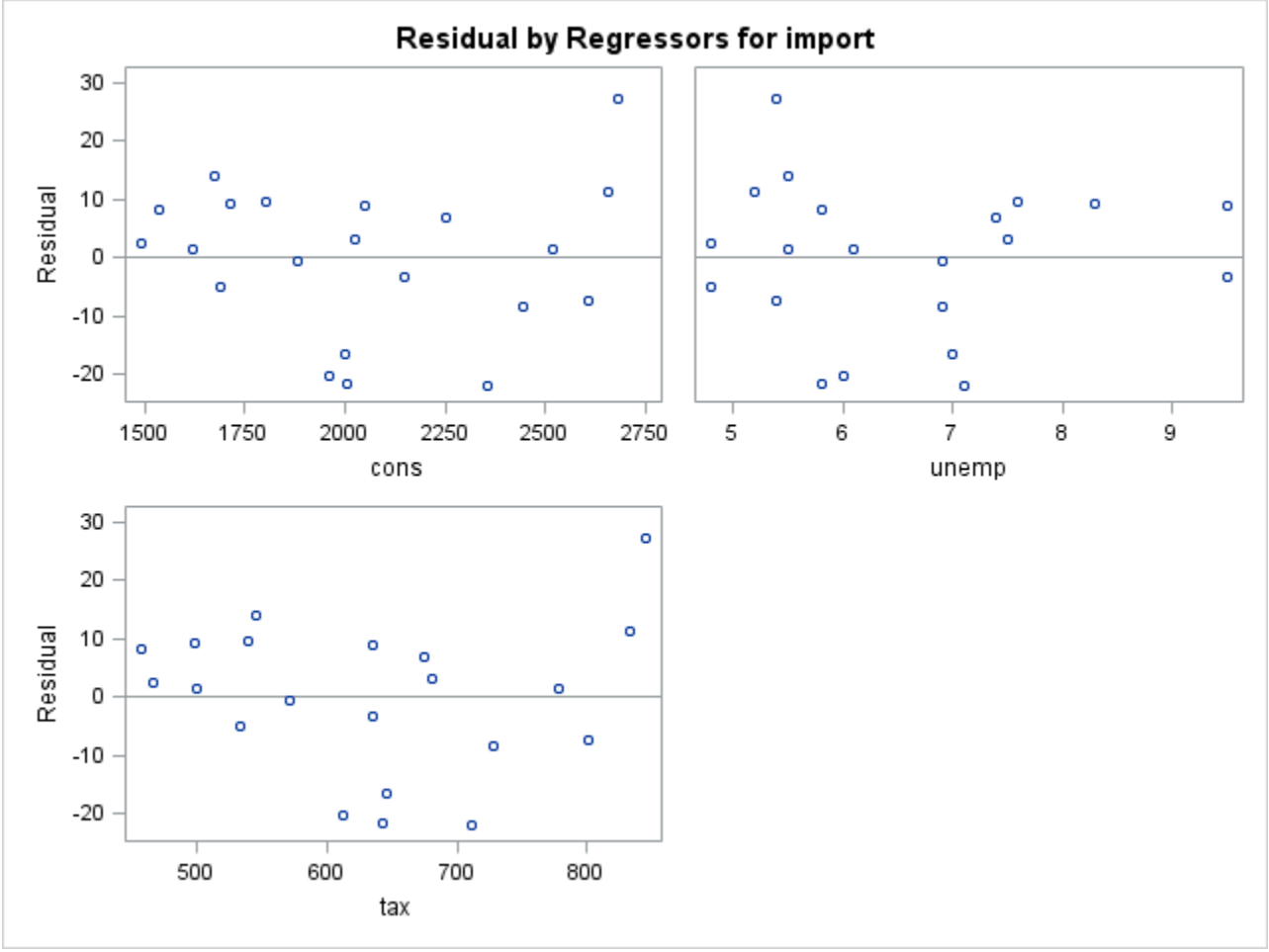
Durbin-Watson D	1.069
Pr < DW	0.0014
Pr > DW	0.9986
Number of Observations	21
1st Order Autocorrelation	0.351

Note: Pr<DW is the p-value for testing positive autocorrelation, and Pr>DW is the p-value for testing negative autocorrelation.

P507 Autocorrelation Example - U.S. Import Data

The REG Procedure
Model: MODEL1
Dependent Variable: import




Residual by Regressors for import
Residual
30
20
10
0
-10
-20
1500
1750
2000
2250
2500
2750
cons
5
6
7
8
9
unemp
500
600
700
800
tax

P507 Autocorrelation Example - U.S. Import Data
First Round Estimate of Rho

The REG Procedure
Model: MODEL1
Dependent Variable: resid Residual

Number of Observations Read	21
Number of Observations Used	20
Number of Observations with Missing Values	1

Note: No intercept in model. R-Square is redefined.

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	515.15981	515.15981	3.61	0.0728
Error	19	2712.75544	142.77660		
Uncorrected Total	20	3227.91525			

Root MSE	11.94892	**R-Square**	0.1596
Dependent Mean	-0.12793	**Adj R-Sq**	0.1154
Coeff Var	-9340.26251		

Parameter Estimates

Variable	Label	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
residl		1	0.45399	0.23900	1.90	0.0728

P507 Autocorrelation Example - U.S. Import Data
First Round WLS Estimates

The REG Procedure
Model: MODEL1
Dependent Variable: import2

Number of Observations Read	21
Number of Observations Used	20
Number of Observations with Missing Values	1

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	130837	43612	269.60	<.0001
Error	16	2588.30480	161.76905		
Corrected Total	19	133426			

Root MSE	12.71885	R-Square	0.9806
Dependent Mean	225.30993	Adj R-Sq	0.9770
Coeff Var	5.64504		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	-159.29220	23.76929	-6.70	<.0001
cons2	1	0.43364	0.05315	8.16	<.0001
unemp2	1	-17.00126	3.44944	-4.93	0.0002
tax2	1	-0.16067	0.16913	-0.95	0.3563

P507 Autocorrelation Example - U.S. Import Data
First Round WLS Estimates

The REG Procedure
Model: MODEL1
Dependent Variable: import2

Durbin-Watson D	1.638
Pr < DW	0.0873
Pr > DW	0.9127
Number of Observations	20
1st Order Autocorrelation	0.082

Note: Pr<DW is the p-value for testing positive autocorrelation, and Pr>DW is the p-value for testing negative autocorrelation.

P507 Autocorrelation Example - U.S. Import Data
Second Round Estimate of Rho

The REG Procedure
Model: MODEL1
Dependent Variable: resid2

Number of Observations Read	21
Number of Observations Used	20
Number of Observations with Missing Values	1

Note: No intercept in model. R-Square is redefined.

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	938.73956	938.73956	6.98	0.0161
Error	19	2555.12771	134.48041		
Uncorrected Total	20	3493.86727			

Root MSE	11.59657	**R-Square**	0.2687
Dependent Mean	-0.61367	**Adj R-Sq**	0.2302
Coeff Var	-1889.72160		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
resid2l	1	0.55910	0.21161	2.64	0.0161

P507 Autocorrelation Example - U.S. Import Data
Second Round Estimate of Rho

The REG Procedure
Model: MODEL1
Dependent Variable: import3

Number of Observations Read	21
Number of Observations Used	20
Number of Observations with Missing Values	1

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	92389	30796	194.19	<.0001
Error	16	2537.41155	158.58822		
Corrected Total	19	94927			

Root MSE	12.59318	R-Square	0.9733
Dependent Mean	186.35931	Adj R-Sq	0.9683
Coeff Var	6.75747		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	-134.69952	23.31602	-5.78	<.0001
cons3	1	0.42287	0.05432	7.78	<.0001
unemp3	1	-15.85432	3.72668	-4.25	0.0006
tax3	1	-0.11626	0.17319	-0.67	0.5116

P507 Autocorrelation Example - U.S. Import Data
Second Round Estimate of Rho

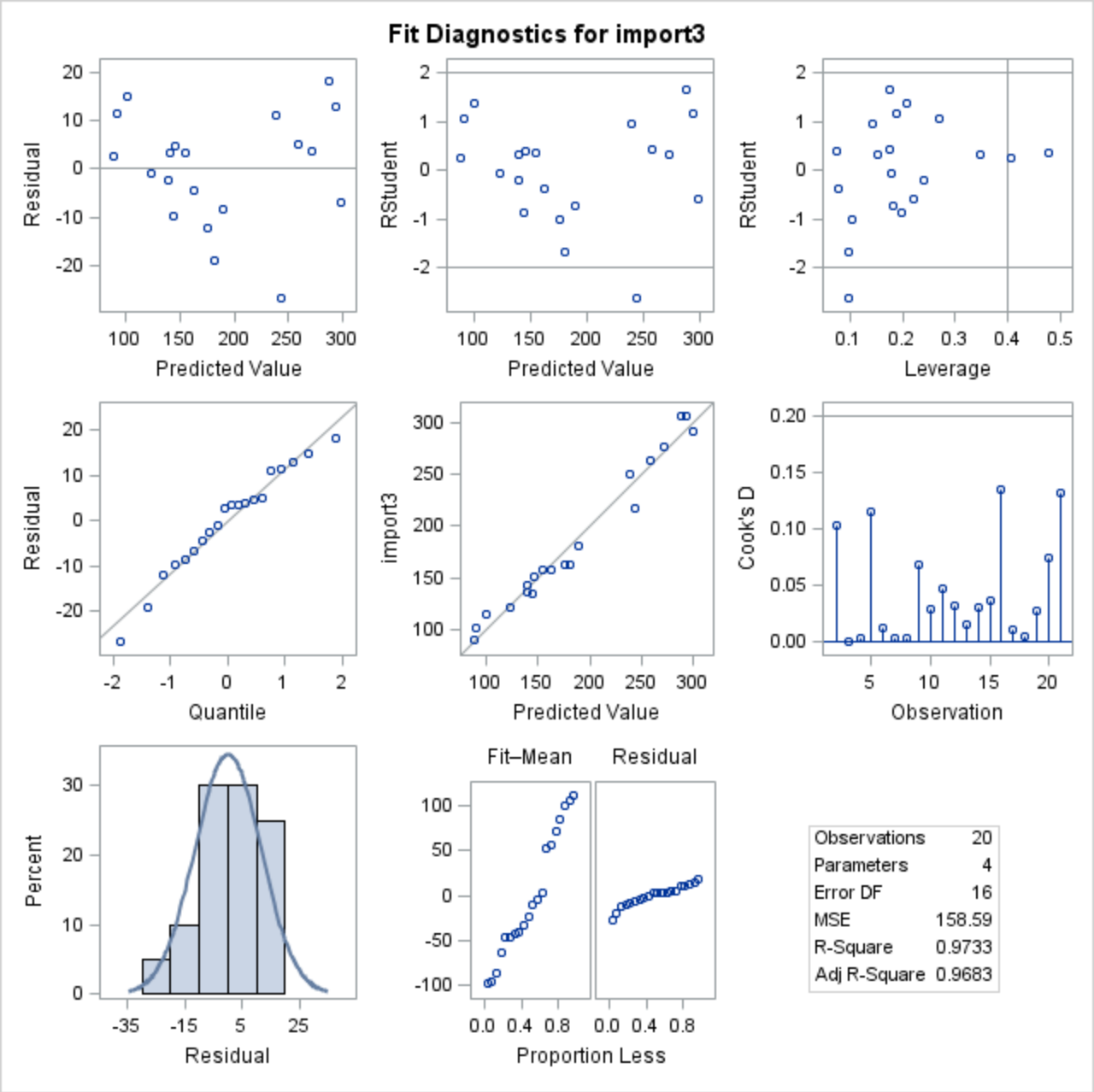
The REG Procedure
Model: MODEL1
Dependent Variable: import3

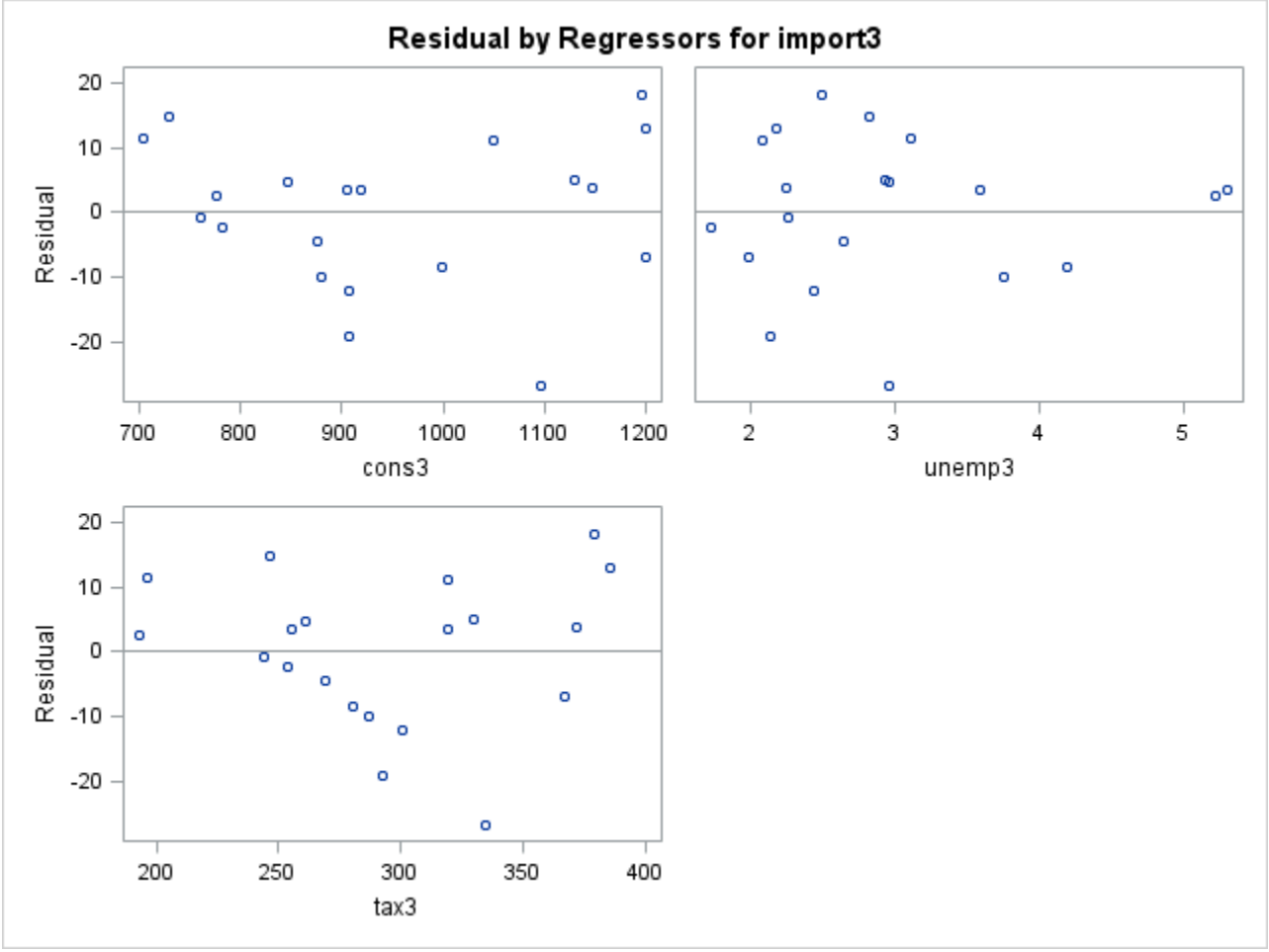
Durbin-Watson D	1.837
Pr < DW	0.1986
Pr > DW	0.8014
Number of Observations	20
1st Order Autocorrelation	-0.008

Note: Pr<DW is the p-value for testing positive autocorrelation, and Pr>DW is the p-value for testing negative autocorrelation.

P507 Autocorrelation Example - U.S. Import Data
Second Round Estimate of Rho

The REG Procedure
Model: MODEL1
Dependent Variable: import3




Residual by Regressors for import3
Residual
20
10
0
-10
-20
700
800
900
1000
1100
1200
cons3
2
3
4
5
unemp3
200
250
300
350
400
tax3

R for final model

The CORR Procedure

2 Variables:	import imphat

Simple Statistics						
Variable	N	Mean	Std Dev	Sum	Minimum	Maximum
import	21	384.72381	144.36728	8079	208.30000	667.80000
imphat	21	384.69966	146.55672	8079	195.22272	644.81247

Pearson Correlation Coefficients, N = 21 Prob > |r| under H0: Rho=0		
	import	imphat
import	1.00000	0.99542 <.0001
imphat	0.99542 <.0001	1.00000

R for final model
Yule-Walker WLS Estimates Using Proc AutoReg with Tax

The AUTOREG Procedure

Dependent Variable	import

R for final model
Yule-Walker WLS Estimates Using Proc AutoReg with Tax

The AUTOREG Procedure

Ordinary Least Squares Estimates			
SSE	3234.4616	DFE	17
MSE	190.26245	Root MSE	13.79357
SBC	177.55251	AIC	173.37442
MAE	9.93821221	AICC	175.87442
MAPE	2.69120021	HQC	174.281173
Durbin-Watson	1.0691	Regress R-Square	0.9922
		Total R-Square	0.9922

Parameter Estimates					
Variable	DF	Estimate	Standard Error	t Value	Approx Pr > |t|
Intercept	1	-264.2562	22.8123	-11.58	<.0001
cons	1	0.4669	0.0469	9.95	<.0001
unemp	1	-19.3904	2.3864	-8.13	<.0001
tax	1	-0.2869	0.1492	-1.92	0.0713

Estimates of Autocorrelations			
Lag	Covariance	Correlation	-1 9 8 7 6 5 4 3 2 1 0 1 2 3 4 5 6 7 8 9 1
0	154.0	1.000000	| |********************|
1	54.0357	0.350831	| |******* |

Preliminary MSE	135.1

Estimates of Autoregressive Parameters			
Lag	Coefficient	Standard Error	t Value
1	-0.350831	0.234110	-1.50

Algorithm converged.

R for final model
Yule-Walker WLS Estimates Using Proc AutoReg with Tax

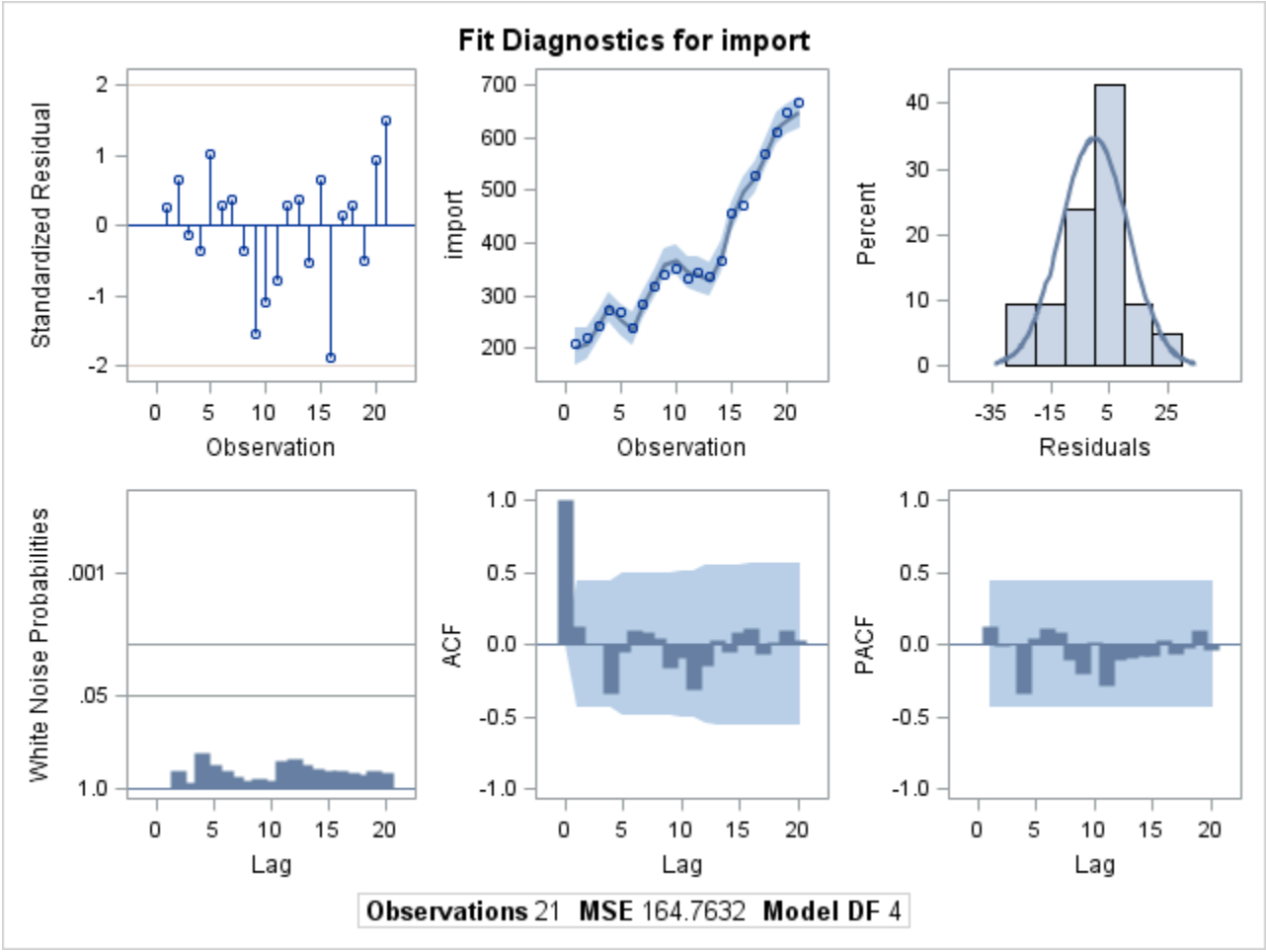
The AUTOREG Procedure

Yule-Walker Estimates			
SSE	2636.21185	**DFE**	16
MSE	164.76324	**Root MSE**	12.83601
SBC	176.510324	**AIC**	171.287712
MAE	9.14834661	**AICC**	175.287712
MAPE	2.47305921	**HQC**	172.421153
Durbin-Watson	1.5808	**Regress R-Square**	0.9846
		Total R-Square	0.9937

Parameter Estimates					
Variable	**DF**	**Estimate**	**Standard Error**	**t Value**	**Approx Pr > |t|**
Intercept	1	-276.9774	32.2165	-8.60	<.0001
cons	1	0.4364	0.0532	8.20	<.0001
unemp	1	-17.8475	3.1053	-5.75	<.0001
tax	1	-0.1827	0.1666	-1.10	0.2889

R for final model
Yule-Walker WLS Estimates Using Proc AutoReg with Tax

The AUTOREG Procedure



R for PROC AUTOREG final model

The CORR Procedure

2 Variables:	import imphat2

Simple Statistics						
Variable	N	Mean	Std Dev	Sum	Minimum	Maximum
import	21	384.72381	144.36728	8079	208.30000	667.80000
imphat2	21	385.74566	144.23303	8101	203.46440	642.70374

Pearson Correlation Coefficients, N = 21 Prob > |r| under H0: Rho=0		
	import	imphat2
import	1.00000	0.99595 <.0001
imphat2	0.99595 <.0001	1.00000