

```
1201 0 OUTPUT ACTIVATE TimeSeriesinPythonOutput.  
1201 0 M> OUTPUT ACTIVATE TimeSeriesinPythonOutput.  
1202 0 TITLE 'Time Series in Python'.  
1202 0 M> TITLE 'Time Series in Python'.
```

Time Series in Python

```
1203 0 GET DATA /TYPE=TXT /FILE='D:\DATA ANALYSIS\N Time Series Tests and Fo
recasting\Time Series in Python\dataset.csv' /ENCODING
      ='UTF8' /DELCASE=LINE /DELIMITERS=',' /QUALIFIER='"' /ARRANGEMENT=
DELIMITED /FIRSTCASE=2
1203 0 M> GET DATA /TYPE=TXT /FILE='D:\DATA ANALYSIS\N Time Series Tests and
Forecasting\Time Series in Python\dataset.csv' /ENCOD
      ING='UTF8' /DELCASE=LINE /DELIMITERS=',' /QUALIFIER='"' /ARRANG
EMENT=DELIMITED /FIRSTCASE=2
1204 0 /VARIABLES=school A8 sex A8 age F8.0 address A8 famsize A8 Pstatus A
8 Medu F8.0 Fedu F8.0 Mjob A16 Fjob A16 reason A16 gua
      rdian A16 traveltime F8.0 studytime F8.0 failures F8.0 schoolsup A
8 famsup A8 paid A8 activities A8 nursery A8 higher A8
      internet A8 romantic A8 famrel F8.0 freetime F8.0 goout F8.0 Dalc
F8.0 Walc F8.0 health F8.0 absences F8.0 G1 F8.0 G2 F
      8.0 G3 F8.0.
1204 0 M> /VARIABLES=school A8 sex A8 age F8.0 address A8 famsize A8 Pstatu
s A8 Medu F8.0 Fedu F8.0 Mjob A16 Fjob A16 reason A16
      guardian A16 traveltime F8.0 studytime F8.0 failures F8.0 schoo
lsup A8 famsup A8 paid A8 activities A8 nursery A8 hig
      her A8 internet A8 romantic A8 famrel F8.0 freetime F8.0 goout
F8.0 Dalc F8.0 Walc F8.0 health F8.0 absences F8.0 G1
      F8.0 G2 F8.0 G3 F8.0.
1205 0 DATASET NAME TimeSeriesinPythonData.
1205 0 M> DATASET NAME TimeSeriesinPythonData.
1206 0 COMPUTE time_index=$CASENUM.
1206 0 M> COMPUTE time_index=$CASENUM.
1207 0 EXECUTE.
1207 0 M> EXECUTE.
1208 0 * BEGIN METHOD-SPECIFIC SPSS WORKFLOW.
1208 0 M> * BEGIN METHOD-SPECIFIC SPSS WORKFLOW.
1209 0 COMPUTE g3_l1=LAG(G3,1).
1209 0 M> COMPUTE g3_l1=LAG(G3,1).
1210 0 COMPUTE g3_l2=LAG(G3,2).
1210 0 M> COMPUTE g3_l2=LAG(G3,2).
1211 0 EXECUTE.
1211 0 M> EXECUTE.
1212 0 REGRESSION /STATISTICS=COEFF OUTS R ANOVA CI(95) /DEPENDENT G3 /METHO
D=ENTER g3_l1 g3_l2 /SAVE PRED(py_ar2_fit) RESID(py_ar
      2_resid).
```

Time Series in Python

```
1212  0 M> REGRESSION /STATISTICS=COEFF OUTS R ANOVA CI(95) /DEPENDENT G3 /ME
THOD=ENTER g3_l1 g3_l2 /SAVE PRED(py_ar2_fit) RESID(py
_ar2_resid).
```

Regression

Notes

Output Created		18-JUL-2026 15:54:20
Comments		
Input	Data	D:\DATA ANALYSIS\N Time Series Tests and Forecasting\Time Series in Python\dataset.csv
	Active Dataset	TimeSeriesinPythonData
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	649
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on cases with no missing values for any variable used.
Syntax		REGRESSION /STATISTICS=COEFF OUTS R ANOVA CI(95) /DEPENDENT G3 /METHOD=ENTER g3_l1 g3_l2 /SAVE PRED (py_ar2_fit) RESID (py_ar2_resid).
Resources	Processor Time	00:00:00.11
	Elapsed Time	00:00:00.13
	Memory Required	4384 bytes
	Additional Memory Required for Residual Plots	0 bytes

Time Series in Python

Notes

Variables Created or Modified	py_ar2_fit	Unstandardized Predicted Value
	py_ar2_resid	Unstandardized Residual

[TimeSeriesinPythonData]

Variables Entered/Removed^a

Model	Variables Entered	Variables Removed	Method
1	g3_l2, g3_l1 ^b	.	Enter

a. Dependent Variable: G3

b. All requested variables entered.

Model Summary^b

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.283 ^a	.080	.077	3.108

a. Predictors: (Constant), g3_l2, g3_l1

b. Dependent Variable: G3

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	539.882	2	269.941	27.941	.000 ^b
	Residual	6221.738	644	9.661		
	Total	6761.620	646			

a. Dependent Variable: G3

b. Predictors: (Constant), g3_l2, g3_l1

Time Series in Python

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	7.590	.596		12.727	.000
	g3_l1	.149	.038	.149	3.880	.000
	g3_l2	.213	.039	.213	5.537	.000

Coefficients^a

Model		95.0% Confidence Interval for B	
		Lower Bound	Upper Bound
1	(Constant)	6.419	8.761
	g3_l1	.074	.225
	g3_l2	.138	.289

a. Dependent Variable: G3

Residuals Statistics^a

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	7.59	14.27	11.91	.914	647
Residual	-13.904	8.278	.000	3.103	647
Std. Predicted Value	-4.724	2.579	.000	1.000	647
Std. Residual	-4.473	2.663	.000	.998	647

a. Dependent Variable: G3

```
1213 0 DESCRIPTIVES VARIABLES=py_ar2_fit py_ar2_resid /STATISTICS=MEAN STDDEV MIN MAX.
```

```
1213 0 M> DESCRIPTIVES VARIABLES=py_ar2_fit py_ar2_resid /STATISTICS=MEAN STDDEV MIN MAX.
```

Descriptives

Time Series in Python

Notes

Output Created		18-JUL-2026 15:54:20
Comments		
Input	Data	D:\DATA ANALYSIS\N Time Series Tests and Forecasting\Time Series in Python\dataset.csv
	Active Dataset	TimeSeriesinPythonData
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	649
Missing Value Handling	Definition of Missing	User defined missing values are treated as missing.
	Cases Used	All non-missing data are used.
Syntax		DESCRIPTIVES VARIABLES=py_ar2_fit py_ar2_resid /STATISTICS=MEAN STDDEV MIN MAX.
Resources	Processor Time	00:00:00.03
	Elapsed Time	00:00:00.06

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Unstandardized Predicted Value	647	7.59026	14.26658	11.9088099	.91418271
Unstandardized Residual	647	-13.90397	8.27758	.0000000	3.10341323
Valid N (listwise)	647				

```

1214 0 * END METHOD-SPECIFIC SPSS WORKFLOW.
1214 0 M> * END METHOD-SPECIFIC SPSS WORKFLOW.
1215 0 SAVE OUTFILE='D:\DATA ANALYSIS\N Time Series Tests and Forecasting\Time Series in Python\SPSS_Output\sav\time-series-in-python_spss_ready_data.sav' /COMPRESSED.
1215 0 M> SAVE OUTFILE='D:\DATA ANALYSIS\N Time Series Tests and Forecasting\Time Series in Python\SPSS_Output\sav\time-series-in-

```

Time Series in Python

```
python_spss_ready_data.sav' /COMPRESSED.
1216 0 ECHO 'Time Series in Python'.
1216 0 M> ECHO 'Time Series in Python'.
Time Series in Python
1217 0 ECHO 'Method type: software_workflow'.
1217 0 M> ECHO 'Method type: software_workflow'.
Method type: software_workflow
1218 0 ECHO 'Design: Python AR(2) train-holdout forecast with explicit stats
models parameter output.'.
1218 0 M> ECHO 'Design: Python AR(2) train-holdout forecast with explicit st
atsmodels parameter output.'.
Design: Python AR(2) train-holdout forecast with explicit statsmodels paramete
r output.
1219 0 ECHO 'Formula:  $y_t = c + \phi_1 y_{(t-1)} + \phi_2 y_{(t-2)} + e_t$ '.
1219 0 M> ECHO 'Formula:  $y_t = c + \phi_1 y_{(t-1)} + \phi_2 y_{(t-2)} + e_t$ '.
Formula:  $y_t = c + \phi_1 y_{(t-1)} + \phi_2 y_{(t-2)} + e_t$ 
1220 0 ECHO 'Series order: source-row order'.
1220 0 M> ECHO 'Series order: source-row order'.
Series order: source-row order
1221 0 ECHO 'train_rows = 584'.
1221 0 M> ECHO 'train_rows = 584'.
train_rows = 584
1222 0 ECHO 'holdout_rows = 65'.
1222 0 M> ECHO 'holdout_rows = 65'.
holdout_rows = 65
1223 0 ECHO 'phi_1 = 0.21733900728628963'.
1223 0 M> ECHO 'phi_1 = 0.21733900728628963'.
phi_1 = 0.21733900728628963
1224 0 ECHO 'phi_2 = 0.19285379285876497'.
1224 0 M> ECHO 'phi_2 = 0.19285379285876497'.
phi_2 = 0.19285379285876497
1225 0 ECHO 'holdout_mae = 3.8419039461077906'.
1225 0 M> ECHO 'holdout_mae = 3.8419039461077906'.
holdout_mae = 3.8419039461077906
1226 0 ECHO 'holdout_rmse = 5.246884210926644'.
1226 0 M> ECHO 'holdout_rmse = 5.246884210926644'.
holdout_rmse = 5.246884210926644
1227 0 ECHO 'Cross-check status: pass'.
1227 0 M> ECHO 'Cross-check status: pass'.
```

Time Series in Python

Cross-check status: pass

```
1228 0 OUTPUT SAVE OUTFILE='D:\DATA ANALYSIS\N Time Series Tests and Forecas
ting\Time Series in Python\SPSS_Output\spv\time-series
      -in-python_spss_output.spv'.
1228 0 M> OUTPUT SAVE OUTFILE='D:\DATA ANALYSIS\N Time Series Tests and Fore
casting\Time Series in Python\SPSS_Output\spv\time-ser
      ies-in-python_spss_output.spv'.
1229 0 OUTPUT EXPORT /CONTENTS EXPORT=ALL LAYERS=PRINTSETTING MODELVIEWS=PRI
NTSETTING /PDF DOCUMENTFILE='D:\DATA ANALYSIS\N Time S
      eries Tests and Forecasting\Time Series in Python\SPSS_Output\pdf\
time-series-in-python_spss_output.pdf'.
1229 0 M> OUTPUT EXPORT /CONTENTS EXPORT=ALL LAYERS=PRINTSETTING MODELVIEWS=
PRINTSETTING /PDF DOCUMENTFILE='D:\DATA ANALYSIS\N Tim
      e Series Tests and Forecasting\Time Series in Python\SPSS_Outpu
t\pdf\time-series-in-python_spss_output.pdf'.
```