

```
38 0 OUTPUT ACTIVATE AutocorrelationFunctionOutput.  
38 0 M> OUTPUT ACTIVATE AutocorrelationFunctionOutput.  
39 0 TITLE 'Autocorrelation Function'.  
39 0 M> TITLE 'Autocorrelation Function'.
```

Autocorrelation Function

```
40 0 GET DATA /TYPE=TXT /FILE='D:\DATA ANALYSIS\N Time Series Tests and Fo
recasting\Autocorrelation Function\dataset.csv' /ENCOD
      ING='UTF8' /DELCASE=LINE /DELIMITERS=', ' /QUALIFIER='"' /ARRANGEME
NT=DELIMITED /FIRSTCASE=2
40 0 M> GET DATA /TYPE=TXT /FILE='D:\DATA ANALYSIS\N Time Series Tests and
Forecasting\Autocorrelation Function\dataset.csv' /EN
      CODING='UTF8' /DELCASE=LINE /DELIMITERS=', ' /QUALIFIER='"' /ARR
ANGEMENT=DELIMITED /FIRSTCASE=2
41 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.
41 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.
42 0 DATASET NAME AutocorrelationFunctionData.
42 0 M> DATASET NAME AutocorrelationFunctionData.
43 0 COMPUTE time_index=$CASENUM.
43 0 M> COMPUTE time_index=$CASENUM.
44 0 EXECUTE.
44 0 M> EXECUTE.
45 0 * BEGIN METHOD-SPECIFIC SPSS WORKFLOW.
45 0 M> * BEGIN METHOD-SPECIFIC SPSS WORKFLOW.
46 0 ACF VARIABLES=G3 /NOLOG /MXAUTO 20 /ERROR=IND.
46 0 M> ACF VARIABLES=G3 /NOLOG /MXAUTO 20 /ERROR=IND.
```

ACF

Autocorrelation Function

Notes

Output Created		18-JUL-2026 16:00:48
Comments		
Input	Data	D:\DATA ANALYSIS\N Time Series Tests and Forecasting\Autocorrelation Function\dataset.csv
	Active Dataset	AutocorrelationFunctionData
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	649
	Date	<none>
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	For a given time series variable, cases with missing values are not used in the analysis. Also, cases with negative or zero values are not used, if the log transform is requested.
Syntax		ACF VARIABLES=G3 /NOLOG /MXAUTO 20 /SERROR=IND.
Resources	Processor Time	00:00:04.88
	Elapsed Time	00:00:01.69
Use	From	First observation
	To	Last observation
Time Series Settings (TSET)	Amount of Output	PRINT = DEFAULT
	Saving New Variables	NEWVAR = CURRENT
	Maximum Number of Lags in Autocorrelation or Partial Autocorrelation Plots	MXAUTO = 16
	Maximum Number of Lags Per Cross-Correlation Plots	MXCROSS = 7

Autocorrelation Function

Notes

Maximum Number of New Variables Generated Per Procedure	MXNEWVAR = 60
Maximum Number of New Cases Per Procedure	MPREDICT = 1000
Treatment of User-Missing Values	MISSING = EXCLUDE
Confidence Interval Percentage Value	CIN = 95
Tolerance for Entering Variables in Regression Equations	TOLER = .0001
Maximum Iterative Parameter Change	CNVERGE = .001
Method of Calculating Std. Errors for Autocorrelations	ACFSE = IND
Length of Seasonal Period	Unspecified
Variable Whose Values Label Observations in Plots	Unspecified
Equations Include	CONSTANT

[AutocorrelationFunctionData]

Model Description

Model Name	MOD_1
Series Name	1
Transformation	None
Non-Seasonal Differencing	0
Seasonal Differencing	0
Length of Seasonal Period	No periodicity
Maximum Number of Lags	20
Process Assumed for Calculating the Standard Errors of the Autocorrelations	Independence(white noise)
Display and Plot	All lags

Applying the model specifications from MOD_1

Autocorrelation Function

Case Processing Summary

G3		
Series Length		649
Number of Missing Values	User-Missing	0
	System-Missing	0
Number of Valid Values		649
Number of Computable First Lags		648

G3

Autocorrelations

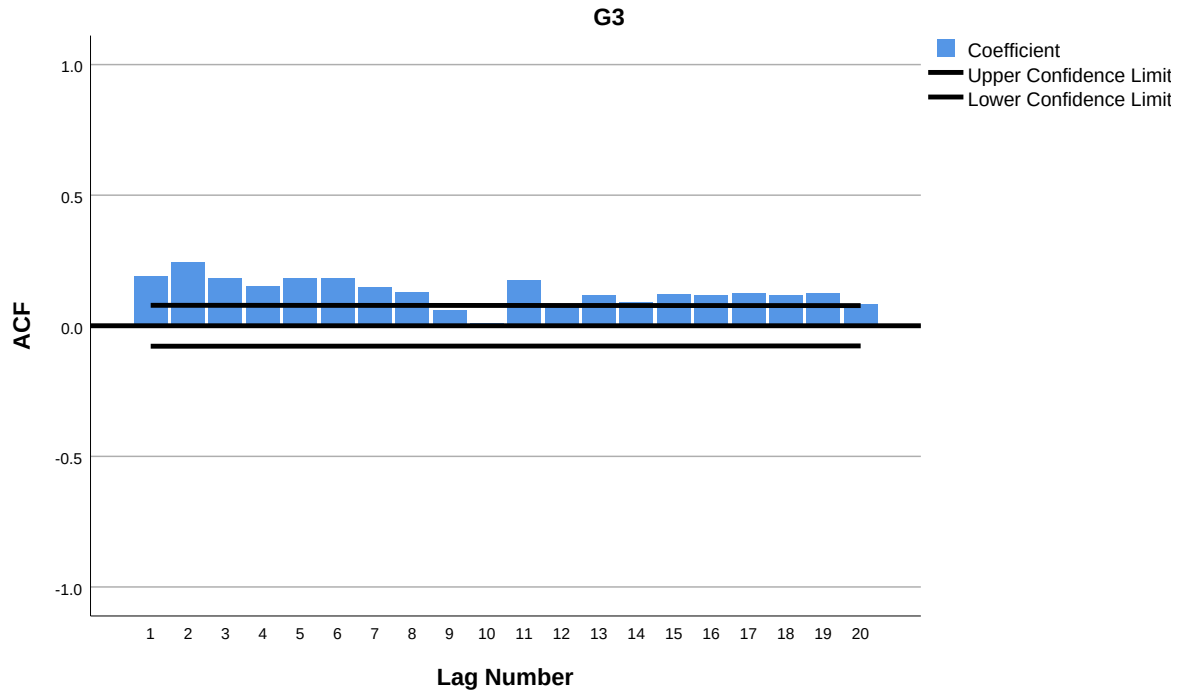
Series: G3

Lag	Autocorrelation	Std. Error ^a	Box-Ljung Statistic		
			Value	df	Sig. ^b
1	.190	.039	23.516	1	.000
2	.241	.039	61.573	2	.000
3	.183	.039	83.558	3	.000
4	.152	.039	98.645	4	.000
5	.180	.039	119.940	5	.000
6	.180	.039	141.271	6	.000
7	.149	.039	155.848	7	.000
8	.128	.039	166.660	8	.000
9	.060	.039	169.060	9	.000
10	.009	.039	169.112	10	.000
11	.173	.039	189.042	11	.000
12	.080	.039	193.307	12	.000
13	.115	.039	202.135	13	.000
14	.089	.039	207.421	14	.000
15	.119	.039	216.936	15	.000
16	.118	.039	226.194	16	.000
17	.124	.039	236.496	17	.000
18	.117	.039	245.594	18	.000
19	.125	.039	256.122	19	.000
20	.082	.039	260.607	20	.000

a. The underlying process assumed is independence (white noise).

Autocorrelation Function

b. Based on the asymptotic chi-square approximation.



```
47 0  COMPUTE  g3_l1=LAG(G3,1).
47 0 M>  COMPUTE  g3_l1=LAG(G3,1).
48 0  COMPUTE  g3_l2=LAG(G3,2).
48 0 M>  COMPUTE  g3_l2=LAG(G3,2).
49 0  COMPUTE  g3_l3=LAG(G3,3).
49 0 M>  COMPUTE  g3_l3=LAG(G3,3).
50 0  COMPUTE  g3_l4=LAG(G3,4).
50 0 M>  COMPUTE  g3_l4=LAG(G3,4).
51 0  COMPUTE  g3_l5=LAG(G3,5).
51 0 M>  COMPUTE  g3_l5=LAG(G3,5).
52 0  EXECUTE.
52 0 M>  EXECUTE.
53 0  CORRELATIONS /VARIABLES=G3 g3_l1 g3_l2 g3_l3 g3_l4 g3_l5.
53 0 M>  CORRELATIONS /VARIABLES=G3 g3_l1 g3_l2 g3_l3 g3_l4 g3_l5.
```

Correlations

Autocorrelation Function

Notes

Output Created		18-JUL-2026 16:00:50
Comments		
Input	Data	D:\DATA ANALYSIS\N Time Series Tests and Forecasting\Autocorrelation Function\dataset.csv
	Active Dataset	AutocorrelationFunctionData
	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 for each pair of variables are based on all the cases with valid data for that pair.
Syntax		CORRELATIONS /VARIABLES=G3 g3_I1 g3_I2 g3_I3 g3_I4 g3_I5.
Resources	Processor Time	00:00:00.08
	Elapsed Time	00:00:00.04

Autocorrelation Function

Correlations

		G3	g3_l1	g3_l2	g3_l3	g3_l4	g3_l5
G3	Pearson Correlation	1	.190	.242	.184	.152	.181
	Sig. (2-tailed)		.000	.000	.000	.000	.000
	N	649	648	647	646	645	644
g3_l1	Pearson Correlation	.190	1	.190	.241	.184	.152
	Sig. (2-tailed)	.000		.000	.000	.000	.000
	N	648	648	647	646	645	644
g3_l2	Pearson Correlation	.242	.190	1	.189	.243	.184
	Sig. (2-tailed)	.000	.000		.000	.000	.000
	N	647	647	647	646	645	644
g3_l3	Pearson Correlation	.184	.241	.189	1	.191	.242
	Sig. (2-tailed)	.000	.000	.000		.000	.000
	N	646	646	646	646	645	644
g3_l4	Pearson Correlation	.152	.184	.243	.191	1	.193
	Sig. (2-tailed)	.000	.000	.000	.000		.000
	N	645	645	645	645	645	644
g3_l5	Pearson Correlation	.181	.152	.184	.242	.193	1
	Sig. (2-tailed)	.000	.000	.000	.000	.000	
	N	644	644	644	644	644	644

```

54 0 * END METHOD-SPECIFIC SPSS WORKFLOW.
54 0 M> * END METHOD-SPECIFIC SPSS WORKFLOW.
55 0 SAVE OUTFILE='D:\DATA ANALYSIS\N Time Series Tests and Forecasting\Autocorrelation Function\SPSS_Output\sav\autocorrelation
      -function_spss_ready_data.sav' /COMPRESSED.
55 0 M> SAVE OUTFILE='D:\DATA ANALYSIS\N Time Series Tests and Forecasting\Autocorrelation Function\SPSS_Output\sav\autocorrelat
      ion-function_spss_ready_data.sav' /COMPRESSED.
56 0 ECHO 'Autocorrelation Function'.
56 0 M> ECHO 'Autocorrelation Function'.
Autocorrelation Function
57 0 ECHO 'Method type: serial_dependence_analysis'.
57 0 M> ECHO 'Method type: serial_dependence_analysis'.
Method type: serial_dependence_analysis
58 0 ECHO 'Design: Sample autocorrelation of G3 through lag 20 with Bartlett-style 95% intervals.'.

```


Autocorrelation Function

```
58 0 M> ECHO 'Design: Sample autocorrelation of G3 through lag 20 with Bartlett-style 95% intervals.'.
Design: Sample autocorrelation of G3 through lag 20 with Bartlett-style 95% intervals.
59 0 ECHO 'Formula: rho_k=sum((y_t-ybar)(y_(t-k)-ybar))/sum((y_t-ybar)^2)'
.
59 0 M> ECHO 'Formula: rho_k=sum((y_t-ybar)(y_(t-k)-ybar))/sum((y_t-ybar)^2)'.
Formula: rho_k=sum((y_t-ybar)(y_(t-k)-ybar))/sum((y_t-ybar)^2)
60 0 ECHO 'Series order: source-row order'.
60 0 M> ECHO 'Series order: source-row order'.
Series order: source-row order
61 0 ECHO 'n_series = 649'.
61 0 M> ECHO 'n_series = 649'.
n_series = 649
62 0 ECHO 'lag_1_acf = 0.18991499138005194'.
62 0 M> ECHO 'lag_1_acf = 0.18991499138005194'.
lag_1_acf = 0.18991499138005194
63 0 ECHO 'lag_5_acf = 0.1801650657088329'.
63 0 M> ECHO 'lag_5_acf = 0.1801650657088329'.
lag_5_acf = 0.1801650657088329
64 0 ECHO 'lag_10_acf = 0.008852239424299977'.
64 0 M> ECHO 'lag_10_acf = 0.008852239424299977'.
lag_10_acf = 0.008852239424299977
65 0 ECHO 'maximum_absolute_acf_lags_1_20 = 0.2414098030528116'.
65 0 M> ECHO 'maximum_absolute_acf_lags_1_20 = 0.2414098030528116'.
maximum_absolute_acf_lags_1_20 = 0.2414098030528116
66 0 ECHO 'approximate_95_bound = 0.07693672985392824'.
66 0 M> ECHO 'approximate_95_bound = 0.07693672985392824'.
approximate_95_bound = 0.07693672985392824
67 0 ECHO 'Cross-check status: pass'.
67 0 M> ECHO 'Cross-check status: pass'.
Cross-check status: pass
68 0 OUTPUT SAVE OUTFILE='D:\DATA ANALYSIS\N Time Series Tests and Forecasting\Autocorrelation Function\SPSS_Output\spv\autocorrelation-function_spss_output.spv'.
68 0 M> OUTPUT SAVE OUTFILE='D:\DATA ANALYSIS\N Time Series Tests and Forecasting\Autocorrelation Function\SPSS_Output\spv\autocorrelation-function_spss_output.spv'.
```

Autocorrelation Function

```
69 0 OUTPUT EXPORT /CONTENTS EXPORT=ALL LAYERS=PRINTSETTING MODELVIEWS=PRI
NTSETTING /PDF DOCUMENTFILE='D:\DATA ANALYSIS\N Time S
eries Tests and Forecasting\Autocorrelation Function\SPSS_Output\p
df\autocorrelation-function_spss_output.pdf'.
69 0 M> OUTPUT EXPORT /CONTENTS EXPORT=ALL LAYERS=PRINTSETTING MODELVIEWS=
PRINTSETTING /PDF DOCUMENTFILE='D:\DATA ANALYSIS\N Tim
e Series Tests and Forecasting\Autocorrelation Function\SPSS_Ou
tput\pdf\autocorrelation-function_spss_output.pdf'.
```