

```
73 0 OUTPUT ACTIVATE ARCHTestOutput.  
73 0 M> OUTPUT ACTIVATE ARCHTestOutput.  
74 0 TITLE 'ARCH Test'.  
74 0 M> TITLE 'ARCH Test'.
```

ARCHTest

```
75 0 GET DATA /TYPE=TXT /FILE='D:\DATA ANALYSIS\N Time Series Tests and Fo
recasting\ARCH Test\dataset.csv' /ENCODING='UTF8' /DEL
CASE=LINE /DELIMITERS=', ' /QUALIFIER='"' /ARRANGEMENT=DELIMITED /F
IRSTCASE=2
75 0 M> GET DATA /TYPE=TXT /FILE='D:\DATA ANALYSIS\N Time Series Tests and
Forecasting\ARCH Test\dataset.csv' /ENCODING='UTF8' /
DELCASE=LINE /DELIMITERS=', ' /QUALIFIER='"' /ARRANGEMENT=DELIMI
TED /FIRSTCASE=2
76 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.
76 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.
77 0 DATASET NAME ARCHTestData.
77 0 M> DATASET NAME ARCHTestData.
78 0 COMPUTE time_index=$CASENUM.
78 0 M> COMPUTE time_index=$CASENUM.
79 0 EXECUTE.
79 0 M> EXECUTE.
80 0 * BEGIN METHOD-SPECIFIC SPSS WORKFLOW.
80 0 M> * BEGIN METHOD-SPECIFIC SPSS WORKFLOW.
81 0 COMPUTE g3_l1=LAG(G3,1).
81 0 M> COMPUTE g3_l1=LAG(G3,1).
82 0 EXECUTE.
82 0 M> EXECUTE.
83 0 REGRESSION /STATISTICS=COEFF OUTS R ANOVA CI(95) /DEPENDENT G3 /METHO
D=ENTER time_index g3_l1 /SAVE RESID(ar_resid).
83 0 M> REGRESSION /STATISTICS=COEFF OUTS R ANOVA CI(95) /DEPENDENT G3 /ME
THOD=ENTER time_index g3_l1 /SAVE RESID(ar_resid).
```

Regression

ARCH Test

Notes

Output Created		18-JUL-2026 15:49:59
Comments		
Input	Data	D:\DATA ANALYSIS\N Time Series Tests and Forecasting\ARCH Test\dataset.csv
	Active Dataset	ARCHTestData
	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 time_index g3_l1 /SAVE RESID(ar_resid).
Resources	Processor Time	00:00:00.16
	Elapsed Time	00:00:00.21
	Memory Required	4352 bytes
	Additional Memory Required for Residual Plots	0 bytes
Variables Created or Modified	ar_resid	Unstandardized Residual

[ARCHTestData]

ARCH Test

Variables Entered/Removed^a

Model	Variables Entered	Variables Removed	Method
1	g3_l1, time_index ^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	.240 ^a	.058	.055	3.143

a. Predictors: (Constant), g3_l1, time_index

b. Dependent Variable: G3

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	389.681	2	194.841	19.720	.000 ^b
	Residual	6372.763	645	9.880		
	Total	6762.444	647			

a. Dependent Variable: G3

b. Predictors: (Constant), g3_l1, time_index

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	10.798	.559		19.320	.000
	time_index	-.003	.001	-.149	-3.840	.000
	g3_l1	.164	.039	.164	4.213	.000

ARCH Test

Coefficients^a

Model		95.0% Confidence Interval for B	
		Lower Bound	Upper Bound
1	(Constant)	9.700	11.895
	time_index	-.004	-.001
	g3_l1	.087	.240

a. Dependent Variable: G3

Residuals Statistics^a

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	9.14	13.55	11.91	.776	648
Residual	-12.280	8.766	.000	3.138	648
Std. Predicted Value	-3.561	2.121	.000	1.000	648
Std. Residual	-3.907	2.789	.000	.998	648

a. Dependent Variable: G3

```

84 0 COMPUTE resid_sq=ar_resid**2.
84 0 M> COMPUTE resid_sq=ar_resid**2.
85 0 COMPUTE sq_l1=LAG(resid_sq,1).
85 0 M> COMPUTE sq_l1=LAG(resid_sq,1).
86 0 COMPUTE sq_l2=LAG(resid_sq,2).
86 0 M> COMPUTE sq_l2=LAG(resid_sq,2).
87 0 COMPUTE sq_l3=LAG(resid_sq,3).
87 0 M> COMPUTE sq_l3=LAG(resid_sq,3).
88 0 COMPUTE sq_l4=LAG(resid_sq,4).
88 0 M> COMPUTE sq_l4=LAG(resid_sq,4).
89 0 COMPUTE sq_l5=LAG(resid_sq,5).
89 0 M> COMPUTE sq_l5=LAG(resid_sq,5).
90 0 EXECUTE.
90 0 M> EXECUTE.
91 0 REGRESSION /STATISTICS=COEFF OUTS R ANOVA CI(95) /DEPENDENT resid_sq
/METHOD=ENTER sq_l1 sq_l2 sq_l3 sq_l4 sq_l5.
91 0 M> REGRESSION /STATISTICS=COEFF OUTS R ANOVA CI(95) /DEPENDENT resid_
sq /METHOD=ENTER sq_l1 sq_l2 sq_l3 sq_l4 sq_l5.

```

ARCH Test

Regression

Notes

Output Created		18-JUL-2026 15:49:59
Comments		
Input	Data	D:\DATA ANALYSIS\N Time Series Tests and Forecasting\ARCH Test\dataset.csv
	Active Dataset	ARCHTestData
	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 resid_sq /METHOD=ENTER sq_l1 sq_l2 sq_l3 sq_l4 sq_l5.
Resources	Processor Time	00:00:00.03
	Elapsed Time	00:00:00.34
	Memory Required	6368 bytes
	Additional Memory Required for Residual Plots	0 bytes

ARCH Test

Variables Entered/Removed^a

Model	Variables Entered	Variables Removed	Method
1	sq_l5, sq_l1, sq_l3, sq_l2, sq_l4 ^b	.	Enter

a. Dependent Variable: resid_sq

b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.201 ^a	.040	.033	20.81452

a. Predictors: (Constant), sq_l5, sq_l1, sq_l3, sq_l2, sq_l4

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	11574.695	5	2314.939	5.343	.000 ^b
	Residual	275976.612	637	433.244		
	Total	287551.307	642			

a. Dependent Variable: resid_sq

b. Predictors: (Constant), sq_l5, sq_l1, sq_l3, sq_l2, sq_l4

ARCH Test

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	6.538	1.083		6.034	.000
	sq_l1	.085	.040	.085	2.157	.031
	sq_l2	.083	.040	.083	2.090	.037
	sq_l3	.114	.040	.114	2.888	.004
	sq_l4	.054	.040	.054	1.348	.178
	sq_l5	.004	.040	.004	.099	.921

Coefficients^a

Model		95.0% Confidence Interval for B	
		Lower Bound	Upper Bound
1	(Constant)	4.410	8.665
	sq_l1	.008	.163
	sq_l2	.005	.161
	sq_l3	.037	.192
	sq_l4	-.024	.132
	sq_l5	-.074	.082

a. Dependent Variable: resid_sq

```

92 0 * END METHOD-SPECIFIC SPSS WORKFLOW.
92 0 M> * END METHOD-SPECIFIC SPSS WORKFLOW.
93 0 SAVE OUTFILE='D:\DATA ANALYSIS\N Time Series Tests and Forecasting\ARCH Test\SPSS_Output\sav\arch-test_spss_ready_data.sav'
    /COMPRESSED.
93 0 M> SAVE OUTFILE='D:\DATA ANALYSIS\N Time Series Tests and Forecasting\ARCH Test\SPSS_Output\sav\arch-test_spss_ready_data.sav' /COMPRESSED.
94 0 ECHO 'ARCH Test'.
94 0 M> ECHO 'ARCH Test'.
ARCH Test
95 0 ECHO 'Method type: hypothesis_test'.
95 0 M> ECHO 'Method type: hypothesis_test'.
Method type: hypothesis_test

```


ARCH Test

```
96 0 ECHO 'Design: Engle ARCH LM test on AR(1) residuals with five squared
-red-residual lags.'.
96 0 M> ECHO 'Design: Engle ARCH LM test on AR(1) residuals with five squared-residual lags.'.
Design: Engle ARCH LM test on AR(1) residuals with five squared-residual lags.
97 0 ECHO 'Formula: LM=n*R^2 ~ chi-square(q), q=5'.
97 0 M> ECHO 'Formula: LM=n*R^2 ~ chi-square(q), q=5'.
Formula: LM=n*R^2 ~ chi-square(q), q=5
98 0 ECHO 'Series order: source-row order'.
98 0 M> ECHO 'Series order: source-row order'.
Series order: source-row order
99 0 ECHO 'arch_lm = 25.761680130690934'.
99 0 M> ECHO 'arch_lm = 25.761680130690934'.
arch_lm = 25.761680130690934
100 0 ECHO 'df = 5'.
100 0 M> ECHO 'df = 5'.
df = 5
101 0 ECHO 'lm_p_value = 9.925124057363941e-05'.
101 0 M> ECHO 'lm_p_value = 9.925124057363941e-05'.
lm_p_value = 9.925124057363941e-05
102 0 ECHO 'f_statistic = 5.343264889999599'.
102 0 M> ECHO 'f_statistic = 5.343264889999599'.
f_statistic = 5.343264889999599
103 0 ECHO 'f_p_value = 8.042733579509157e-05'.
103 0 M> ECHO 'f_p_value = 8.042733579509157e-05'.
f_p_value = 8.042733579509157e-05
104 0 ECHO 'n_residuals = 648'.
104 0 M> ECHO 'n_residuals = 648'.
n_residuals = 648
105 0 ECHO 'Cross-check status: pass'.
105 0 M> ECHO 'Cross-check status: pass'.
Cross-check status: pass
106 0 OUTPUT SAVE OUTFILE='D:\DATA ANALYSIS\N Time Series Tests and Forecasting\ARCH Test\SPSS_Output\spv\arch-test_spss_output.spv'.
106 0 M> OUTPUT SAVE OUTFILE='D:\DATA ANALYSIS\N Time Series Tests and Forecasting\ARCH Test\SPSS_Output\spv\arch-test_spss_output.spv'.
```

ARCH Test

```
107 0 OUTPUT EXPORT /CONTENTS EXPORT=ALL LAYERS=PRINTSETTING MODELVIEWS=PRI
NTSETTING /PDF DOCUMENTFILE='D:\DATA ANALYSIS\N Time S
eries Tests and Forecasting\ARCH Test\SPSS_Output\pdf\arch-test_sp
ss_output.pdf'.
107 0 M> OUTPUT EXPORT /CONTENTS EXPORT=ALL LAYERS=PRINTSETTING MODELVIEWS=
PRINTSETTING /PDF DOCUMENTFILE='D:\DATA ANALYSIS\N Tim
e Series Tests and Forecasting\ARCH Test\SPSS_Output\pdf\arch-t
est_spss_output.pdf'.
```