

```
797 0 OUTPUT ACTIVATE MAModelOutput.  
797 0 M> OUTPUT ACTIVATE MAModelOutput.  
798 0 TITLE 'MA Model'.  
798 0 M> TITLE 'MA Model'.
```

MA Model

```
799 0 GET DATA /TYPE=TXT /FILE='D:\DATA ANALYSIS\N Time Series Tests and Fo
recasting\MA Model\dataset.csv' /ENCODING='UTF8' /DELC
ASE=LINE /DELIMITERS=', ' /QUALIFIER='"' /ARRANGEMENT=DELIMITED /FI
RSTCASE=2
799 0 M> GET DATA /TYPE=TXT /FILE='D:\DATA ANALYSIS\N Time Series Tests and
Forecasting\MA Model\dataset.csv' /ENCODING='UTF8' /D
ELCASE=LINE /DELIMITERS=', ' /QUALIFIER='"' /ARRANGEMENT=DELIMIT
ED /FIRSTCASE=2
800 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.
800 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.
801 0 DATASET NAME MAModelData.
801 0 M> DATASET NAME MAModelData.
802 0 COMPUTE time_index=$CASENUM.
802 0 M> COMPUTE time_index=$CASENUM.
803 0 EXECUTE.
803 0 M> EXECUTE.
804 0 * BEGIN METHOD-SPECIFIC SPSS WORKFLOW.
804 0 M> * BEGIN METHOD-SPECIFIC SPSS WORKFLOW.
805 0 REGRESSION /STATISTICS=COEFF OUTS R ANOVA CI(95) /DEPENDENT G3 /METHO
D=ENTER time_index /SAVE RESID(ma_e).
805 0 M> REGRESSION /STATISTICS=COEFF OUTS R ANOVA CI(95) /DEPENDENT G3 /ME
THOD=ENTER time_index /SAVE RESID(ma_e).
```

Regression

MA Model

Notes

Output Created		18-JUL-2026 15:53:04
Comments		
Input	Data	D:\DATA ANALYSIS\N Time Series Tests and Forecasting\MA Model\dataset.csv
	Active Dataset	MAModelData
	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 /SAVE RESID (ma_e).
Resources	Processor Time	00:00:00.09
	Elapsed Time	00:00:00.20
	Memory Required	3840 bytes
	Additional Memory Required for Residual Plots	0 bytes
Variables Created or Modified	ma_e	Unstandardized Residual

[MAModelData]

MA Model

Variables Entered/Removed^a

Model	Variables Entered	Variables Removed	Method
1	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	.177 ^a	.031	.030	3.182

a. Predictors: (Constant), time_index

b. Dependent Variable: G3

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	211.509	1	211.509	20.887	.000 ^b
	Residual	6551.757	647	10.126		
	Total	6763.267	648			

a. Dependent Variable: G3

b. Predictors: (Constant), time_index

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	12.896	.250		51.562	.000
	time_index	-.003	.001	-.177	-4.570	.000

MA Model

Coefficients^a

Model		95.0% Confidence Interval for B	
		Lower Bound	Upper Bound
1	(Constant)	12.405	13.387
	time_index	-.004	-.002

a. Dependent Variable: G3

Residuals Statistics^a

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	10.92	12.89	11.91	.571	649
Residual	-12.397	8.045	.000	3.180	649
Std. Predicted Value	-1.728	1.728	.000	1.000	649
Std. Residual	-3.896	2.528	.000	.999	649

a. Dependent Variable: G3

```

806 0 COMPUTE e_l1=LAG(ma_e).
806 0 M> COMPUTE e_l1=LAG(ma_e).
807 0 REGRESSION /STATISTICS=COEFF OUTS R ANOVA CI(95) /DEPENDENT G3 /METHO
D=ENTER time_index e_l1 /SAVE PRED(ma1_fit) RESID(ma1_
      resid).
807 0 M> REGRESSION /STATISTICS=COEFF OUTS R ANOVA CI(95) /DEPENDENT G3 /ME
THOD=ENTER time_index e_l1 /SAVE PRED(ma1_fit) RESID(m
      a1_resid).

```

Regression

MA Model

Notes

Output Created		18-JUL-2026 15:53:04
Comments		
Input	Data	D:\DATA ANALYSIS\N Time Series Tests and Forecasting\MA Model\dataset.csv
	Active Dataset	MAModelData
	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 e_l1 /SAVE PRED(ma1_fit) RESID (ma1_resid).
Resources	Processor Time	00:00:00.09
	Elapsed Time	00:00:00.18
	Memory Required	4384 bytes
	Additional Memory Required for Residual Plots	0 bytes
Variables Created or Modified	ma1_fit	Unstandardized Predicted Value
	ma1_resid	Unstandardized Residual

MA Model

Variables Entered/Removed^a

Model	Variables Entered	Variables Removed	Method
1	e_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), e_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), e_l1, time_index

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	12.908	.248		52.087	.000
	time_index	-.003	.001	-.178	-4.657	.000
	e_l1	.164	.039	.161	4.213	.000

MA Model

Coefficients^a

Model		95.0% Confidence Interval for B	
		Lower Bound	Upper Bound
1	(Constant)	12.421	13.395
	time_index	-.004	-.002
	e_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

```

808 0 * END METHOD-SPECIFIC SPSS WORKFLOW.
808 0 M> * END METHOD-SPECIFIC SPSS WORKFLOW.
809 0 SAVE OUTFILE='D:\DATA ANALYSIS\N Time Series Tests and Forecasting\MA
Model\SPSS_Output\sav\ma-model_spss_ready_data.sav' /
COMPRESSED.
809 0 M> SAVE OUTFILE='D:\DATA ANALYSIS\N Time Series Tests and Forecasting
\MA Model\SPSS_Output\sav\ma-model_spss_ready_data.sav
' /COMPRESSED.
810 0 ECHO 'MA Model'.
810 0 M> ECHO 'MA Model'.
MA Model
811 0 ECHO 'Method type: moving_average_error_model'.
811 0 M> ECHO 'Method type: moving_average_error_model'.
Method type: moving_average_error_model
812 0 ECHO 'Design: MA(1) stochastic error model fitted to the level G3 ser
ies.'.
812 0 M> ECHO 'Design: MA(1) stochastic error model fitted to the level G3
series.'.
Design: MA(1) stochastic error model fitted to the level G3 series.

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MA Model

```

813 0 ECHO 'Formula: y_t=c+e_t+theta_1*e_(t-1)'.
813 0 M> ECHO 'Formula: y_t=c+e_t+theta_1*e_(t-1)'.
Formula: y_t=c+e_t+theta_1*e_(t-1)
814 0 ECHO 'Series order: source-row order'.
814 0 M> ECHO 'Series order: source-row order'.
Series order: source-row order
815 0 ECHO 'ma_order = 1'.
815 0 M> ECHO 'ma_order = 1'.
ma_order = 1
816 0 ECHO 'ma_1 = 0.13633251602971483'.
816 0 M> ECHO 'ma_1 = 0.13633251602971483'.
ma_1 = 0.13633251602971483
817 0 ECHO 'innovation_variance = 10.154904569624575'.
817 0 M> ECHO 'innovation_variance = 10.154904569624575'.
innovation_variance = 10.154904569624575
818 0 ECHO 'aic = 3352.155140601977'.
818 0 M> ECHO 'aic = 3352.155140601977'.
aic = 3352.155140601977
819 0 ECHO 'bic = 3365.5814387520895'.
819 0 M> ECHO 'bic = 3365.5814387520895'.
bic = 3365.5814387520895
820 0 ECHO 'forecast_1 = 11.808859489688832'.
820 0 M> ECHO 'forecast_1 = 11.808859489688832'.
forecast_1 = 11.808859489688832
821 0 ECHO 'forecast_12 = 11.905781381109415'.
821 0 M> ECHO 'forecast_12 = 11.905781381109415'.
forecast_12 = 11.905781381109415
822 0 ECHO 'Cross-check status: pass'.
822 0 M> ECHO 'Cross-check status: pass'.
Cross-check status: pass
823 0 OUTPUT SAVE OUTFILE='D:\DATA ANALYSIS\N Time Series Tests and Forecas
ting\MA Model\SPSS_Output\spv\ma-model_spss_output.spv
'.
823 0 M> OUTPUT SAVE OUTFILE='D:\DATA ANALYSIS\N Time Series Tests and Fore
casting\MA Model\SPSS_Output\spv\ma-model_spss_output.
spv'.
824 0 OUTPUT EXPORT /CONTENTS EXPORT=ALL LAYERS=PRINTSETTING MODELVIEWS=PRI
NTSETTING /PDF DOCUMENTFILE='D:\DATA ANALYSIS\N Time S

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MA Model

Series Tests and Forecasting\MA Model\SPSS_Output\pdf\ma-model_spss_output.pdf'.

824 0 M> OUTPUT EXPORT /CONTENTS EXPORT=ALL LAYERS=PRINTSETTING MODELVIEWS=PRINTSETTING /PDF DOCUMENTFILE='D:\DATA ANALYSIS\N Tim

e Series Tests and Forecasting\MA Model\SPSS_Output\pdf\ma-model_spss_output.pdf'.