

```
761 0 OUTPUT ACTIVATE CovarianceBasedSEMOutput.  
761 0 M> OUTPUT ACTIVATE CovarianceBasedSEMOutput.  
762 0 TITLE 'Covariance-Based Structural Equation Model'.  
762 0 M> TITLE 'Covariance-Based Structural Equation Model'.
```

Covariance-Based Structural Equation Model

```
763 0
763 0 M>
764 0 GET DATA
764 0 M> GET DATA
765 0 /TYPE=TXT /FILE='D:\DATA ANALYSIS\L Validity Factor Analysis and Scale Testing\Covariance Based SEM\dataset.csv' /ENCODING
    ='UTF8' /DELCASE=LINE /DELIMITERS=', ' /QUALIFIER='''
765 0 M> /TYPE=TXT /FILE='D:\DATA ANALYSIS\L Validity Factor Analysis and Scale Testing\Covariance Based SEM\dataset.csv' /ENCODING
    ='UTF8' /DELCASE=LINE /DELIMITERS=', ' /QUALIFIER='''
766 0 /ARRANGEMENT=DELIMITED /FIRSTCASE=2
766 0 M> /ARRANGEMENT=DELIMITED /FIRSTCASE=2
767 0 /VARIABLES=
767 0 M> /VARIABLES=
768 0 school A8 sex A8 age F8.0 address A8 famsize A8 Pstatus A8 Medu F8.0
    Fedu F8.0
768 0 M> school A8 sex A8 age F8.0 address A8 famsize A8 Pstatus A8 Medu F
    8.0 Fedu F8.0
769 0 Mjob A16 Fjob A16 reason A16 guardian A16 traveltime F8.0 studytime
    F8.0 failures F8.0
769 0 M> Mjob A16 Fjob A16 reason A16 guardian A16 traveltime F8.0 studyti
    me F8.0 failures F8.0
770 0 schoolsup A8 famsup A8 paid A8 activities A8 nursery A8 higher A8 in
    ternet A8 romantic A8
770 0 M> schoolsup A8 famsup A8 paid A8 activities A8 nursery A8 higher A8
    internet A8 romantic A8
771 0 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.
771 0 M> famrel F8.0 freetime F8.0 goout F8.0 Dalc F8.0 Walc F8.0 health F
    8.0 absences F8.0 G1 F8.0 G2 F8.0 G3 F8.0.
772 0 DATASET NAME CovarianceBasedSEMDData.
772 0 M> DATASET NAME CovarianceBasedSEMDData.
773 0 COMPUTE subject_id=$CASENUM.
773 0 M> COMPUTE subject_id=$CASENUM.
774 0 COMPUTE Dalc_R=6-Dalc.
774 0 M> COMPUTE Dalc_R=6-Dalc.
775 0 COMPUTE Walc_R=6-Walc.
775 0 M> COMPUTE Walc_R=6-Walc.
```

Covariance-Based Structural Equation Model

```
776 0 RECODE schoolsup famsup paid activities higher internet ('no'=0) ('yes'=1)
776 0 M> RECODE schoolsup famsup paid activities higher internet ('no'=0) ('yes'=1)
777 0 INTO schoolsup_b famsup_b paid_b activities_b higher_b internet_b.
777 0 M> INTO schoolsup_b famsup_b paid_b activities_b higher_b internet_b
.
778 0 EXECUTE.
778 0 M> EXECUTE.
779 0
779 0 M>
780 0 * BEGIN METHOD-SPECIFIC SPSS WORKFLOW.
780 0 M> * BEGIN METHOD-SPECIFIC SPSS WORKFLOW.
781 0 TITLE 'Covariance Based Structural Equation Model'.
781 0 M> TITLE 'Covariance Based Structural Equation Model'.
```

Covariance Based Structural Equation Model

```
782 0 SUBTITLE 'Measurement diagnostics followed by structural paths'.  
782 0 M> SUBTITLE 'Measurement diagnostics followed by structural paths'.
```

Covariance Based Structural Equation Model
Measurement diagnostics followed by structural paths

783 0 DESCRIPTIVES VARIABLES=G1 G2 G3 famrel freetime goout studytime failures absences /SAVE.

783 0 M> DESCRIPTIVES VARIABLES=G1 G2 G3 famrel freetime goout studytime failures absences /SAVE.

Descriptives

Notes

Output Created		18-JUL-2026 10:55:08
Comments		
Input	Data	D:\DATA ANALYSIS\L Validity Factor Analysis and Scale Testing\Covariance Based SEM\dataset.csv
	Active Dataset	CovarianceBasedSEMDat a
	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=G1 G2 G3 famrel freetime goout studytime failures absences /SAVE.
Resources	Processor Time	00:00:00.08
	Elapsed Time	00:00:00.33
Variables Created or Modified	ZG1	Zscore(G1)
	ZG2	Zscore(G2)
	ZG3	Zscore(G3)
	Zfamrel	Zscore(famrel)
	Zfreetime	Zscore(freetime)
	Zgoout	Zscore(goout)

Covariance Based Structural Equation Model
Measurement diagnostics followed by structural paths

Notes

	Zstudytime	Zscore(studytime)
	Zfailures	Zscore(failures)
	Zabsences	Zscore(absences)

[CovarianceBasedSEMDData]

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
G1	649	0	19	11.40	2.745
G2	649	0	19	11.57	2.914
G3	649	0	19	11.91	3.231
famrel	649	1	5	3.93	.956
freetime	649	1	5	3.18	1.051
goout	649	1	5	3.18	1.176
studytime	649	1	4	1.93	.830
failures	649	0	3	.22	.593
absences	649	0	32	3.66	4.641
Valid N (listwise)	649				

```
784 0 REGRESSION /STATISTICS=COEFF OUTS R ANOVA CHANGE CI(95) /DEPENDENT ZG
3
```

```
784 0 M> REGRESSION /STATISTICS=COEFF OUTS R ANOVA CHANGE CI(95) /DEPENDENT
ZG3
```

```
785 0 /METHOD=ENTER ZG1 Zstudytime Zfailures Zabsences /SAVE PRED RESID.
```

```
785 0 M> /METHOD=ENTER ZG1 Zstudytime Zfailures Zabsences /SAVE PRED RESID
```

Regression

Covariance Based Structural Equation Model
Measurement diagnostics followed by structural paths

Notes

Output Created		18-JUL-2026 10:55:08
Comments		
Input	Data	D:\DATA ANALYSIS\L Validity Factor Analysis and Scale Testing\Covariance Based SEM\dataset.csv
	Active Dataset	CovarianceBasedSEMDat a
	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 CHANGE CI(95) /DEPENDENT ZG3 /METHOD=ENTER ZG1 Zstudytime Zfailures Zabsences /SAVE PRED ...
Resources	Processor Time	00:00:00.09
	Elapsed Time	00:00:00.17
	Memory Required	6112 bytes
	Additional Memory Required for Residual Plots	0 bytes
Variables Created or Modified	PRE_1	Unstandardized Predicted Value
	RES_1	Unstandardized Residual

Covariance Based Structural Equation Model
Measurement diagnostics followed by structural paths

Variables Entered/Removed^a

Model	Variables Entered	Variables Removed	Method
1	Zscore (absences), Zscore (studytime), Zscore (failures), Zscore(G1) ^b	.	Enter

a. Dependent Variable: Zscore(G3)

b. All requested variables entered.

Model Summary^b

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics		
					R Square Change	F Change	df1
1	.832 ^a	.692	.690	.55654826	.692	362.009	4

Model Summary^b

Model	Change Statistics	
	df2	Sig. F Change
1	644	.000

a. Predictors: (Constant), Zscore(absences), Zscore(studytime), Zscore(failures), Zscore(G1)

b. Dependent Variable: Zscore(G3)

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	448.524	4	112.131	362.009	.000 ^b
	Residual	199.476	644	.310		
	Total	648.000	648			

a. Dependent Variable: Zscore(G3)

b. Predictors: (Constant), Zscore(absences), Zscore(studytime), Zscore(failures), Zscore(G1)

Covariance Based Structural Equation Model
Measurement diagnostics followed by structural paths

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-3.278E-15	.022		.000	1.000
	Zscore(G1)	.788	.024	.788	32.320	.000
	Zscore(studytime)	.036	.023	.036	1.563	.119
	Zscore(failures)	-.090	.024	-.090	-3.789	.000
	Zscore(absences)	.040	.022	.040	1.794	.073

Coefficients^a

Model		95.0% Confidence Interval for B	
		Lower Bound	Upper Bound
1	(Constant)	-.043	.043
	Zscore(G1)	.740	.836
	Zscore(studytime)	-.009	.080
	Zscore(failures)	-.137	-.043
	Zscore(absences)	-.004	.084

a. Dependent Variable: Zscore(G3)

Residuals Statistics^a

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	-3.2339556	2.2308772	.0000000	.83196517	649
Residual	-3.22938776	2.95351458	.00000000	.55482786	649
Std. Predicted Value	-3.887	2.681	.000	1.000	649
Std. Residual	-5.803	5.307	.000	.997	649

a. Dependent Variable: Zscore(G3)

```
786 0 CORRELATIONS /VARIABLES=ZG1 ZG2 ZG3 Zfamrel Zfreetime Zgoout /PRINT=T
WOTAIL NOSIG /MISSING=PAIRWISE.
```

```
786 0 M> CORRELATIONS /VARIABLES=ZG1 ZG2 ZG3 Zfamrel Zfreetime Zgoout /PRIN
T=TWOTAIL NOSIG /MISSING=PAIRWISE.
```

Correlations

Covariance Based Structural Equation Model
Measurement diagnostics followed by structural paths

Notes

Output Created		18-JUL-2026 10:55:09
Comments		
Input	Data	D:\DATA ANALYSIS\L Validity Factor Analysis and Scale Testing\Covariance Based SEM\dataset.csv
	Active Dataset	CovarianceBasedSEMDat a
	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=ZG1 ZG2 ZG3 Zfamrel Zfreetime Zgoout /PRINT=TWOTAIL NOSIG /MISSING=PAIRWISE.
Resources	Processor Time	00:00:00.05
	Elapsed Time	00:00:00.16

Covariance Based Structural Equation Model
Measurement diagnostics followed by structural paths

Correlations

		Zscore(G1)	Zscore(G2)	Zscore(G3)	Zscore(famrel)
Zscore(G1)	Pearson Correlation	1	.865**	.826**	.049
	Sig. (2-tailed)		.000	.000	.214
	N	649	649	649	649
Zscore(G2)	Pearson Correlation	.865**	1	.919**	.090*
	Sig. (2-tailed)	.000		.000	.022
	N	649	649	649	649
Zscore(G3)	Pearson Correlation	.826**	.919**	1	.063
	Sig. (2-tailed)	.000	.000		.107
	N	649	649	649	649
Zscore(famrel)	Pearson Correlation	.049	.090*	.063	1
	Sig. (2-tailed)	.214	.022	.107	
	N	649	649	649	649
Zscore(freetime)	Pearson Correlation	-.094*	-.107**	-.123**	.129**
	Sig. (2-tailed)	.016	.007	.002	.001
	N	649	649	649	649
Zscore(goout)	Pearson Correlation	-.074	-.079*	-.088*	.090*
	Sig. (2-tailed)	.059	.043	.026	.022
	N	649	649	649	649

Covariance Based Structural Equation Model
Measurement diagnostics followed by structural paths

Correlations

		Zscore (freetime)	Zscore(goout)
Zscore(G1)	Pearson Correlation	-.094 [*]	-.074
	Sig. (2-tailed)	.016	.059
	N	649	649
Zscore(G2)	Pearson Correlation	-.107 ^{**}	-.079 [*]
	Sig. (2-tailed)	.007	.043
	N	649	649
Zscore(G3)	Pearson Correlation	-.123 ^{**}	-.088 [*]
	Sig. (2-tailed)	.002	.026
	N	649	649
Zscore(famrel)	Pearson Correlation	.129 ^{**}	.090 [*]
	Sig. (2-tailed)	.001	.022
	N	649	649
Zscore(freetime)	Pearson Correlation	1	.346 ^{**}
	Sig. (2-tailed)		.000
	N	649	649
Zscore(goout)	Pearson Correlation	.346 ^{**}	1
	Sig. (2-tailed)	.000	
	N	649	649

^{**}. Correlation is significant at the 0.01 level (2-tailed).

^{*}. Correlation is significant at the 0.05 level (2-tailed).

```

787  0  FACTOR /VARIABLES=G1 G2 G3 famrel freetime goout /CRITERIA=FACTORS(2)
/EXTRACTION=PAF /ROTATION=NOROTATE /PRINT=EXTRACTION
      KMO.
787  0  M> FACTOR /VARIABLES=G1 G2 G3 famrel freetime goout /CRITERIA=FACTORS
(2) /EXTRACTION=PAF /ROTATION=NOROTATE /PRINT=EXTRACTI
      ON KMO.

```

Factor Analysis

Covariance Based Structural Equation Model
Measurement diagnostics followed by structural paths

Notes

Output Created		18-JUL-2026 10:55:09
Comments		
Input	Data	D:\DATA ANALYSIS\L Validity Factor Analysis and Scale Testing\Covariance Based SEM\dataset.csv
	Active Dataset	CovarianceBasedSEMDat a
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	649
Missing Value Handling	Definition of Missing	MISSING=EXCLUDE: User-defined missing values are treated as missing.
	Cases Used	LISTWISE: Statistics are based on cases with no missing values for any variable used.
Syntax		FACTOR /VARIABLES=G1 G2 G3 famrel freetime goout /CRITERIA=FACTORS(2) /EXTRACTION=PAF /ROTATION=NOROTATE /PRINT=EXTRACTION KMO.
Resources	Processor Time	00:00:00.09
	Elapsed Time	00:00:00.10
	Maximum Memory Required	5704 (5.570K) bytes

Covariance Based Structural Equation Model
Measurement diagnostics followed by structural paths

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.732
Bartlett's Test of Sphericity	Approx. Chi-Square	2220.632
	df	15
	Sig.	.000

Factor Matrix^a

	Factor	
	1	2
G1	.879	.052
G2	.980	.069
G3	.936	.033
famrel	.062	.205
freetime	-.152	.654
goout	-.114	.501

Extraction Method: Principal Axis Factoring.

a. Attempted to extract 2 factors. More than 25 iterations required. (Convergence=.002). Extraction was terminated.

Communalities

	Extraction
G1	.775
G2	.966
G3	.878
famrel	.046
freetime	.451
goout	.264

Extraction Method:
Principal Axis Factoring.

Covariance Based Structural Equation Model
Measurement diagnostics followed by structural paths

Total Variance Explained

Factor	Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %
1	2.650	44.164	44.164
2	.730	12.167	56.331

Extraction Method: Principal Axis Factoring.

```

788 0 * END METHOD-SPECIFIC SPSS WORKFLOW.
788 0 M> * END METHOD-SPECIFIC SPSS WORKFLOW.
789 0
789 0 M>
790 0 SAVE OUTFILE='D:\DATA ANALYSIS\L Validity Factor Analysis and Scale T
esting\Covariance Based SEM\SPSS_Output\sav\covariance
      -based-sem_spss_ready_data.sav' /COMPRESSED.
790 0 M> SAVE OUTFILE='D:\DATA ANALYSIS\L Validity Factor Analysis and Scal
e Testing\Covariance Based SEM\SPSS_Output\sav\covaria
      nce-based-sem_spss_ready_data.sav' /COMPRESSED.

791 0
791 0 M>
792 0 ECHO '=====
====='.
792 0 M> ECHO '=====
====='.
=====
793 0 ECHO 'COVARIANCE-BASED STRUCTURAL EQUATION MODEL'.
793 0 M> ECHO 'COVARIANCE-BASED STRUCTURAL EQUATION MODEL'.
COVARIANCE-BASED STRUCTURAL EQUATION MODEL
794 0 ECHO 'Design: ML measurement model followed by latent-score structura
l regression for academic achievement.'.
794 0 M> ECHO 'Design: ML measurement model followed by latent-score struct
ural regression for academic achievement.'.
Design: ML measurement model followed by latent-score structural regression fo
r academic achievement.
795 0 ECHO 'Null hypothesis: Social, study-time, and failure paths jointly
explain no academic-score variance.'.
795 0 M> ECHO 'Null hypothesis: Social, study-time, and failure paths joint
ly explain no academic-score variance.'.

```

Covariance Based Structural Equation Model
Measurement diagnostics followed by structural paths

Null hypothesis: Social, study-time, and failure paths jointly explain no academic-score variance.

```
796 0 ECHO 'Formula: Measurement: Sigma=Lambda Phi Lambda''+Theta; structural: eta=B eta+Gamma x+zeta.'
```

```
796 0 M> ECHO 'Formula: Measurement: Sigma=Lambda Phi Lambda''+Theta; structural: eta=B eta+Gamma x+zeta.'
```

```
Formula: Measurement: Sigma=Lambda Phi Lambda''+Theta; structural: eta=B eta+Gamma x+zeta.
```

```
797 0 ECHO 'Variables: G1, G2, G3, famrel, freetime, goout, studytime, failures'.
```

```
797 0 M> ECHO 'Variables: G1, G2, G3, famrel, freetime, goout, studytime, failures'.
```

```
Variables: G1, G2, G3, famrel, freetime, goout, studytime, failures
```

```
798 0 ECHO 'Rows analyzed: 649'.
```

```
798 0 M> ECHO 'Rows analyzed: 649'.
```

```
Rows analyzed: 649
```

```
799 0 ECHO 'cfi = 0.9973982062491278'.
```

```
799 0 M> ECHO 'cfi = 0.9973982062491278'.
```

```
cfi = 0.9973982062491278
```

```
800 0 ECHO 'chi_square = 13.76397207713822'.
```

```
800 0 M> ECHO 'chi_square = 13.76397207713822'.
```

```
chi_square = 13.76397207713822
```

```
801 0 ECHO 'failures_path = -0.3725739993744453'.
```

```
801 0 M> ECHO 'failures_path = -0.3725739993744453'.
```

```
failures_path = -0.3725739993744453
```

```
802 0 ECHO 'rmsea = 0.03334482463134081'.
```

```
802 0 M> ECHO 'rmsea = 0.03334482463134081'.
```

```
rmsea = 0.03334482463134081
```

```
803 0 ECHO 'social_path = -0.047089820120738896'.
```

```
803 0 M> ECHO 'social_path = -0.047089820120738896'.
```

```
social_path = -0.047089820120738896
```

```
804 0 ECHO 'structural_r_squared = 0.20849058206409432'.
```

```
804 0 M> ECHO 'structural_r_squared = 0.20849058206409432'.
```

```
structural_r_squared = 0.20849058206409432
```

```
805 0 ECHO 'studytime_path = 0.2030470703509362'.
```

```
805 0 M> ECHO 'studytime_path = 0.2030470703509362'.
```

```
studytime_path = 0.2030470703509362
```

```
806 0 ECHO 'Cross-check status: pass'.
```

```
806 0 M> ECHO 'Cross-check status: pass'.
```


Covariance Based Structural Equation Model
Measurement diagnostics followed by structural paths

Cross-check status: pass

```
807 0 ECHO '=====
====='.
807 0 M> ECHO '=====
====='.
=====
808 0
808 0 M>
809 0 OUTPUT SAVE OUTFILE='D:\DATA ANALYSIS\L Validity Factor Analysis and
Scale Testing\Covariance Based SEM\SPSS_Output\spv\cov
ariance-based-sem_spss_output.spv'.
809 0 M> OUTPUT SAVE OUTFILE='D:\DATA ANALYSIS\L Validity Factor Analysis a
nd Scale Testing\Covariance Based SEM\SPSS_Output\spv\
covariance-based-sem_spss_output.spv'.
810 0 OUTPUT EXPORT /CONTENTS EXPORT=ALL LAYERS=PRINTSETTING MODELVIEWS=PRI
NTSETTING
810 0 M> OUTPUT EXPORT /CONTENTS EXPORT=ALL LAYERS=PRINTSETTING MODELVIEWS=
PRINTSETTING
```