

```
1836 0 OUTPUT ACTIVATE PartialLeastSquaresSEMOutput.  
1836 0 M> OUTPUT ACTIVATE PartialLeastSquaresSEMOutput.  
1837 0 TITLE 'Partial Least Squares SEM'.  
1837 0 M> TITLE 'Partial Least Squares SEM'.
```

Partial Least Squares SEM

```

1838 0
1838 0 M>
1839 0 GET DATA
1839 0 M> GET DATA
1840 0 /TYPE=TXT /FILE='D:\DATA ANALYSIS\L Validity Factor Analysis and Scale Testing\Partial Least Squares SEM\dataset.csv' /ENC
      ODING='UTF8' /DELCASE=LINE /DELIMITERS=', ' /QUALIFIER='"'
1840 0 M> /TYPE=TXT /FILE='D:\DATA ANALYSIS\L Validity Factor Analysis and Scale Testing\Partial Least Squares SEM\dataset.csv' /
      ENCODING='UTF8' /DELCASE=LINE /DELIMITERS=', ' /QUALIFIER='"'
1841 0 /ARRANGEMENT=DELIMITED /FIRSTCASE=2
1841 0 M> /ARRANGEMENT=DELIMITED /FIRSTCASE=2
1842 0 /VARIABLES=
1842 0 M> /VARIABLES=
1843 0 school A8 sex A8 age F8.0 address A8 famsize A8 Pstatus A8 Medu F8.0
      Fedu F8.0
1843 0 M> school A8 sex A8 age F8.0 address A8 famsize A8 Pstatus A8 Medu F
      8.0 Fedu F8.0
1844 0 Mjob A16 Fjob A16 reason A16 guardian A16 traveltime F8.0 studytime
      F8.0 failures F8.0
1844 0 M> Mjob A16 Fjob A16 reason A16 guardian A16 traveltime F8.0 studyti
      me F8.0 failures F8.0
1845 0 schoolsup A8 famsup A8 paid A8 activities A8 nursery A8 higher A8 in
      ternet A8 romantic A8
1845 0 M> schoolsup A8 famsup A8 paid A8 activities A8 nursery A8 higher A8
      internet A8 romantic A8
1846 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.
1846 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.
1847 0 DATASET NAME PartialLeastSquaresSEMData.
1847 0 M> DATASET NAME PartialLeastSquaresSEMData.
1848 0 COMPUTE subject_id=$CASENUM.
1848 0 M> COMPUTE subject_id=$CASENUM.
1849 0 COMPUTE Dalc_R=6-Dalc.
1849 0 M> COMPUTE Dalc_R=6-Dalc.
1850 0 COMPUTE Walc_R=6-Walc.
1850 0 M> COMPUTE Walc_R=6-Walc.

```

Partial Least Squares SEM

```
1851 0 RECODE schoolsup famsup paid activities higher internet ('no'=0) ('yes'=1)
1851 0 M> RECODE schoolsup famsup paid activities higher internet ('no'=0) ('yes'=1)
1852 0 INTO schoolsup_b famsup_b paid_b activities_b higher_b internet_b.
1852 0 M> INTO schoolsup_b famsup_b paid_b activities_b higher_b internet_b
.
1853 0 EXECUTE.
1853 0 M> EXECUTE.
1854 0
1854 0 M>
1855 0 * BEGIN METHOD-SPECIFIC SPSS WORKFLOW.
1855 0 M> * BEGIN METHOD-SPECIFIC SPSS WORKFLOW.
1856 0 TITLE 'Partial Least Squares SEM'.
1856 0 M> TITLE 'Partial Least Squares SEM'.
```

Partial Least Squares SEM

```
1857 0 SUBTITLE 'Component-based outer scores and predictive inner paths'.  
1857 0 M> SUBTITLE 'Component-based outer scores and predictive inner paths'  
.
```

Partial Least Squares SEM
Component-based outer scores and predictive inner paths

1858 0 DESCRIPTIVES VARIABLES=G1 G2 G3 famrel freetime goout studytime failures absences /SAVE.

1858 0 M> DESCRIPTIVES VARIABLES=G1 G2 G3 famrel freetime goout studytime failures absences /SAVE.

Descriptives

Notes

Output Created		18-JUL-2026 10:57:16
Comments		
Input	Data	D:\DATA ANALYSIS\L Validity Factor Analysis and Scale Testing\Partial Least Squares SEM\dataset.csv
	Active Dataset	PartialLeastSquaresSEMD ata
	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	00:00:00.07
Variables Created or Modified	ZG1	Zscore(G1)
	ZG2	Zscore(G2)
	ZG3	Zscore(G3)
	Zfamrel	Zscore(famrel)
	Zfreetime	Zscore(freetime)
	Zgoout	Zscore(goout)

Partial Least Squares SEM
Component-based outer scores and predictive inner paths

Notes

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

[PartialLeastSquaresSEMData]

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				

```

1859  0  REGRESSION /STATISTICS=COEFF OUTS R ANOVA CHANGE CI(95) /DEPENDENT ZG
3
1859  0  M>  REGRESSION /STATISTICS=COEFF OUTS R ANOVA CHANGE CI(95) /DEPENDENT
ZG3
1860  0  /METHOD=ENTER ZG1 Zstudytime Zfailures Zabsences /SAVE PRED RESID.
1860  0  M>  /METHOD=ENTER ZG1 Zstudytime Zfailures Zabsences /SAVE PRED RESID
.

```

Regression

Partial Least Squares SEM
Component-based outer scores and predictive inner paths

Notes

Output Created		18-JUL-2026 10:57:16
Comments		
Input	Data	D:\DATA ANALYSIS\L Validity Factor Analysis and Scale Testing\Partial Least Squares SEM\dataset.csv
	Active Dataset	PartialLeastSquaresSEMD ata
	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	00:00:00.19
	Elapsed Time	00:00:00.13
	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

Partial Least Squares SEM
Component-based outer scores and predictive inner 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)

Partial Least Squares SEM
Component-based outer scores and predictive inner 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)

```
1861  0  CORRELATIONS /VARIABLES=ZG1 ZG2 ZG3 Zfamrel Zfreetime Zgoout /PRINT=T
WOTAIL NOSIG /MISSING=PAIRWISE.
1861  0  M> CORRELATIONS /VARIABLES=ZG1 ZG2 ZG3 Zfamrel Zfreetime Zgoout /PRIN
T=TWOTAIL NOSIG /MISSING=PAIRWISE.
```

Correlations

Partial Least Squares SEM
Component-based outer scores and predictive inner paths

Notes

Output Created		18-JUL-2026 10:57:16
Comments		
Input	Data	D:\DATA ANALYSIS\L Validity Factor Analysis and Scale Testing\Partial Least Squares SEM\dataset.csv
	Active Dataset	PartialLeastSquaresSEMD ata
	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	00:00:00.06
	Elapsed Time	00:00:00.05

Partial Least Squares SEM
Component-based outer scores and predictive inner 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

Partial Least Squares SEM
Component-based outer scores and predictive inner 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).

```

1862  0  COMPUTE academic_component=MEAN(G1,G2,G3).
1862  0  M>  COMPUTE academic_component=MEAN(G1,G2,G3).
1863  0  COMPUTE social_component=MEAN(famrel,freetime,goout).
1863  0  M>  COMPUTE social_component=MEAN(famrel,freetime,goout).
1864  0  REGRESSION /STATISTICS=COEFF R ANOVA /DEPENDENT academic_component /M
ETHOD=ENTER social_component studytime failures.
1864  0  M>  REGRESSION /STATISTICS=COEFF R ANOVA /DEPENDENT academic_component
/METHOD=ENTER social_component studytime failures.

```

Regression

Partial Least Squares SEM
Component-based outer scores and predictive inner paths

Notes

Output Created		18-JUL-2026 10:57:16
Comments		
Input	Data	D:\DATA ANALYSIS\L Validity Factor Analysis and Scale Testing\Partial Least Squares SEM\dataset.csv
	Active Dataset	PartialLeastSquaresSEMD ata
	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 R ANOVA /DEPENDENT academic_component /METHOD=ENTER social_component studytime failures.
Resources	Processor Time	00:00:00.05
	Elapsed Time	00:00:00.06
	Memory Required	5664 bytes
	Additional Memory Required for Residual Plots	0 bytes

Partial Least Squares SEM
Component-based outer scores and predictive inner paths

Variables Entered/Removed^a

Model	Variables Entered	Variables Removed	Method
1	failures, social_component, studytime ^b	.	Enter

a. Dependent Variable: academic_component

b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.456 ^a	.208	.204	2.52806

a. Predictors: (Constant), failures, social_component, studytime

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1079.835	3	359.945	56.320	.000 ^b
	Residual	4122.264	645	6.391		
	Total	5202.099	648			

a. Dependent Variable: academic_component

b. Predictors: (Constant), failures, social_component, studytime

Partial Least Squares SEM
Component-based outer scores and predictive inner paths

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	11.157	.553		20.172	.000
	social_component	-.140	.138	-.036	-1.015	.311
	studytime	.696	.121	.204	5.736	.000
	failures	-1.786	.169	-.374	-10.546	.000

a. Dependent Variable: academic_component

```

1865 0 * END METHOD-SPECIFIC SPSS WORKFLOW.
1865 0 M> * END METHOD-SPECIFIC SPSS WORKFLOW.
1866 0
1866 0 M>
1867 0 SAVE OUTFILE='D:\DATA ANALYSIS\L Validity Factor Analysis and Scale T
esting\Partial Least Squares SEM\SPSS_Output\sav\parti
al-least-squares-sem_spss_ready_data.sav' /COMPRESSED.
1867 0 M> SAVE OUTFILE='D:\DATA ANALYSIS\L Validity Factor Analysis and Scal
e Testing\Partial Least Squares SEM\SPSS_Output\sav\pa
rtial-least-squares-sem_spss_ready_data.sav' /COMPRESSED.
1868 0
1868 0 M>
1869 0 ECHO '=====
====='.
1869 0 M> ECHO '=====
====='.
=====
1870 0 ECHO 'PARTIAL LEAST SQUARES SEM'.
1870 0 M> ECHO 'PARTIAL LEAST SQUARES SEM'.
PARTIAL LEAST SQUARES SEM
1871 0 ECHO 'Design: Component-based outer models and predictive structural
regression for academic achievement.'.
1871 0 M> ECHO 'Design: Component-based outer models and predictive structur
al regression for academic achievement.'.
Design: Component-based outer models and predictive structural regression for
academic achievement.

```

Partial Least Squares SEM
Component-based outer scores and predictive inner paths

```
1872 0 ECHO 'Null hypothesis: The PLS construct scores have no predictive st
ructural relationship.'.
1872 0 M> ECHO 'Null hypothesis: The PLS construct scores have no predictive
structural relationship.'.
Null hypothesis: The PLS construct scores have no predictive structural relati
onship.
1873 0 ECHO 'Formula: Outer weights maximize component variance; inner paths
are OLS regressions among construct scores.'.
1873 0 M> ECHO 'Formula: Outer weights maximize component variance; inner pa
ths are OLS regressions among construct scores.'.
Formula: Outer weights maximize component variance; inner paths are OLS regres
sions among construct scores.
1874 0 ECHO 'Variables: G1, G2, G3, famrel, freetime, goout, studytime, fail
ures'.
1874 0 M> ECHO 'Variables: G1, G2, G3, famrel, freetime, goout, studytime, f
ailures'.
Variables: G1, G2, G3, famrel, freetime, goout, studytime, failures
1875 0 ECHO 'Rows analyzed: 649'.
1875 0 M> ECHO 'Rows analyzed: 649'.
Rows analyzed: 649
1876 0 ECHO 'academic_composite_reliability = 0.9693952591759201'.
1876 0 M> ECHO 'academic_composite_reliability = 0.9693952591759201'.
academic_composite_reliability = 0.9693952591759201
1877 0 ECHO 'academic_r_squared = 0.20849058206409432'.
1877 0 M> ECHO 'academic_r_squared = 0.20849058206409432'.
academic_r_squared = 0.20849058206409432
1878 0 ECHO 'failures_to_academic = -0.3725739993744453'.
1878 0 M> ECHO 'failures_to_academic = -0.3725739993744453'.
failures_to_academic = -0.3725739993744453
1879 0 ECHO 'social_composite_reliability = 0.7128393255337119'.
1879 0 M> ECHO 'social_composite_reliability = 0.7128393255337119'.
social_composite_reliability = 0.7128393255337119
1880 0 ECHO 'social_to_academic = -0.047089820120738896'.
1880 0 M> ECHO 'social_to_academic = -0.047089820120738896'.
social_to_academic = -0.047089820120738896
1881 0 ECHO 'studytime_to_academic = 0.2030470703509362'.
1881 0 M> ECHO 'studytime_to_academic = 0.2030470703509362'.
studytime_to_academic = 0.2030470703509362
1882 0 ECHO 'Cross-check status: pass'.
```

Partial Least Squares SEM
Component-based outer scores and predictive inner paths

```
1882  0 M> ECHO 'Cross-check status: pass'.
Cross-check status: pass
1883  0 ECHO '=====
====='.
1883  0 M> ECHO '=====
====='.
=====
1884  0
1884  0 M>
1885  0 OUTPUT SAVE OUTFILE='D:\DATA ANALYSIS\L Validity Factor Analysis and
Scale Testing\Partial Least Squares SEM\SPSS_Output\sp
v\partial-least-squares-sem_spss_output.spv'.
1885  0 M> OUTPUT SAVE OUTFILE='D:\DATA ANALYSIS\L Validity Factor Analysis a
nd Scale Testing\Partial Least Squares SEM\SPSS_Output
\spv\partial-least-squares-sem_spss_output.spv'.
1886  0 OUTPUT EXPORT /CONTENTS EXPORT=ALL LAYERS=PRINTSETTING MODELVIEWS=PRI
NTSETTING
1886  0 M> OUTPUT EXPORT /CONTENTS EXPORT=ALL LAYERS=PRINTSETTING MODELVIEWS=
PRINTSETTING
```