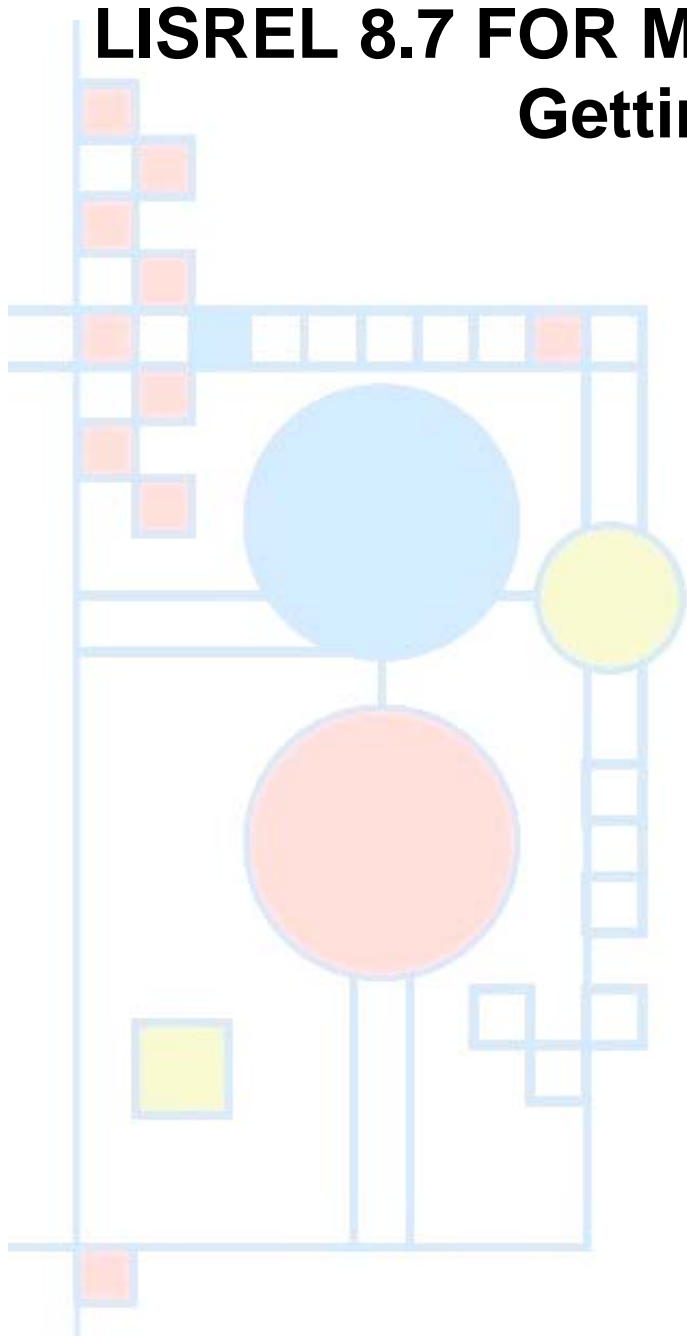


LISREL 8.7 FOR MAC OS 9 AND X: Getting Started Guide

Gerhard Mels



SSI SCIENTIFIC
SOFTWARE
INTERNATIONAL

The correct bibliographic citation for this guide is as follows:

Mels, G. (2004)

*LISREL 8.7 for Mac OS 9 and X: Getting Started Guide
Lincolnwood, IL: Scientific Software International, Inc.*

LISREL® 8.7 for Mac OS 9 and X: Getting Started Guide

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Published by:

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1. Introduction

LISREL 8.7 for Mac OS 9 and X is Macintosh software for Structural Equation Modeling, Multilevel Structural Equation Modeling, Multilevel Linear and Nonlinear Modeling and Generalized Linear Modeling. It consists of the Macintosh text editor application **LISREL 8.7** that interfaces with the Macintosh applications **lisrel**, **prelis**, **multilevel** and **surveyglm**.

The application **prelis** can be used for manipulating data, transforming data, generating data, computing moment matrices, computing asymptotic covariance matrices, performing regression analyses, performing exploratory factor analyses, etc.

The application **lisrel** is intended for Standard and Multilevel Structural Equation Modeling. The Full Information Maximum Likelihood (FIML) method for missing data is also available for both Standard and Multilevel Structural Equation Modeling. These methods are available for simple random sample data as well as complex survey data.

The application **multilevel** fits multilevel linear and nonlinear models to raw data. It allows for weights at the different levels of the multilevel hierarchy.

The application **surveyglm** fits Generalized Linear Models (GLIMs) to simple random sample data and complex survey data.

This document is intended as a very brief tutorial to familiarize users of LISREL 8.7 for Mac OS 9 and X with the basic use of the software. Section 2 describes the various files used and generated by LISREL 8.7 for Mac OS 9 and X. The root window of LISREL 8.7 for Mac OS 9 and X is reviewed in Section 3. In Section 4, the processing of a PRELIS syntax file is demonstrated. Thereafter, submitting a LISREL syntax file, a MULTILEVEL syntax file and a SurveyGLIM syntax file are illustrated in Sections 5, 6 and 7 respectively. Sections 8 and 9 illustrate how to fit a measurement model and a structural equation model to data respectively. The Robust Maximum Likelihood and Weighted Least Squares methods are illustrated in Sections 10 and 11 respectively.

2. Files

LISREL 8.7 for Mac OS 9 and X uses a PRELIS System File (PSF) to store raw data. In this regard, the application *prelis* is used to generate PRELIS System Files from text files with raw data. Whenever *prelis* or *lisrel* processes a PSF, a Data System File (DSF), which has the same file name as the PSF, is created. This DSF contains all the data information (sample size, labels for observed variables, moment matrix, name of the binary file containing the estimated asymptotic covariance matrix) that *lisrel* requires to fit structural equation models to the data.

A structural equation model can be specified by means of a SIMPLIS syntax file or a LISREL syntax file. SIMPLIS and LISREL syntax files are text files with the default extensions SPL and LS8 respectively. These two file types can access the data from the PSF, the DSF or the text data file. If a user has prepared any of these files, then LISREL 8.7 for Mac OS 9 and X can be used to fit the specified model to the data specified in the corresponding PSF or DSF.

SIMPLIS syntax files are described in Jöreskog & Sörbom (1999c) while the LISREL syntax files are outlined in Jöreskog & Sörbom (1999b). These files are also described in the online Help File of LISREL 8.7 for Mac OS 9 and X.

A PRELIS syntax file is a text file with default extension PR2. PRELIS syntax files are described by Jöreskog & Sörbom (1999a) as well as in the online Help File of LISREL 8.7 for Mac OS 9 and X.

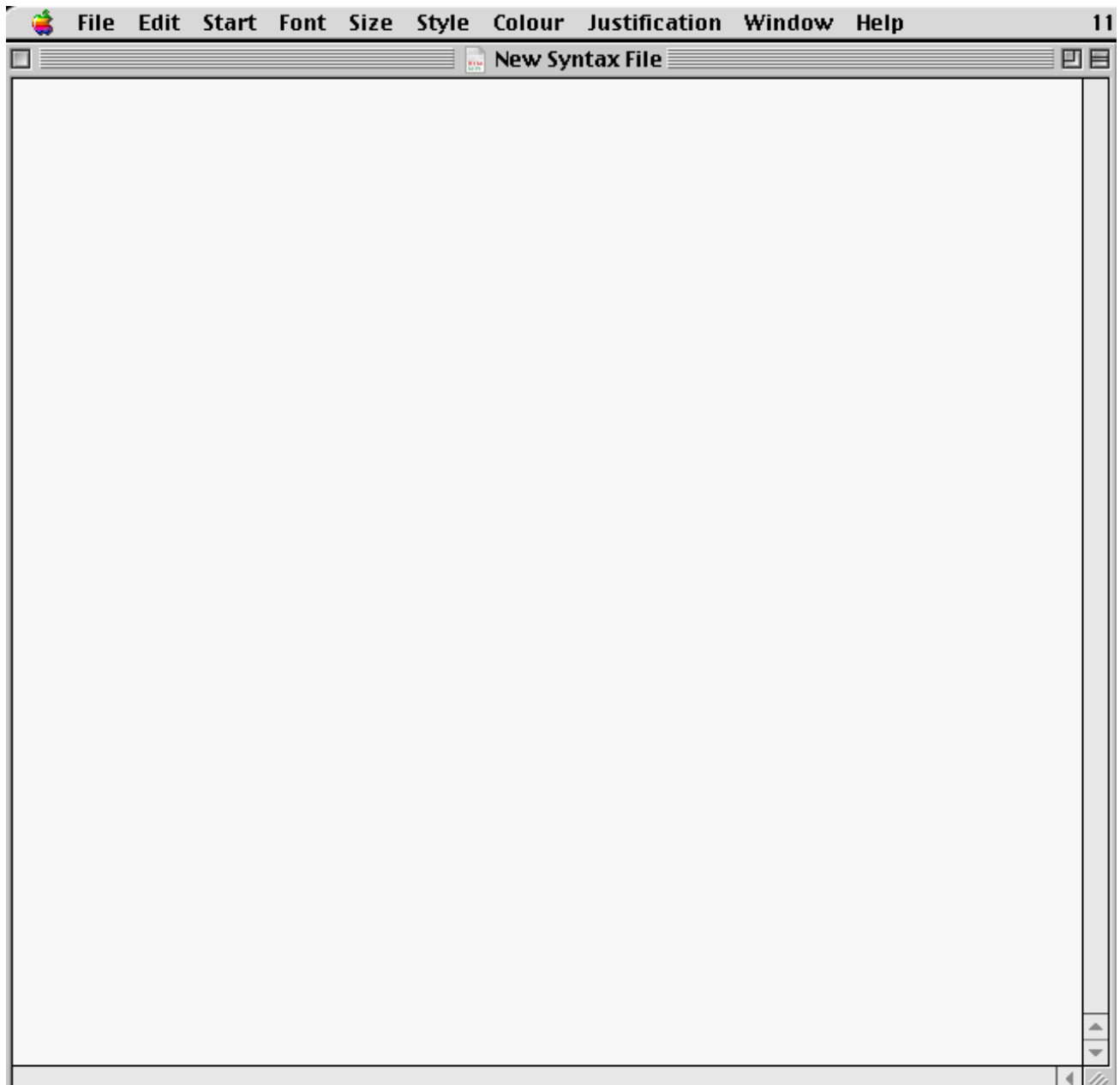
Multilevel Modeling syntax files are also text files with default extension PR2. Multilevel Modeling syntax files are described in Jöreskog et al. (2001). These syntax files are also described in the online Help file of LISREL 8.7 for Mac OS 9 and X.

SurveyGLIM syntax files are described in the online Help file of LISREL 8.7 for Mac OS 9 and X.

The application **LISREL 8.7** starts up by opening a root window with ten menus. The **File** menu can then be used to create new or open existing PRELIS, LISREL, SIMPLIS, MULTILEVEL and SurveyGLIM syntax files and output files. The **Start** menu is used to open the applications *prelis*, *lisrel*, *multilevel* and *surveyglim*.

3. The LISREL 8.7 Root Window

Once the application *LISREL 8.7* is opened by, for example, double-clicking on the *LISREL 8.7* icon, the following root window is opened.



The **Apple** menu of the root Window has the standard options of the Apple menu with a special option for *About LISREL 8.7 for Mac OS 9 and X*.

The options on the **File** menu are:

File	Edit	Start
New		⌘N
Open...		⌘O
Close		⌘W
Save		⌘S
Save As...		
Revert		
Page Setup...		
Print...		⌘P
Quit		⌘Q

These options are the standard file options of any standard Macintosh text editor such as SimpleText or TextEdit.

The options on the **Edit** menu are:

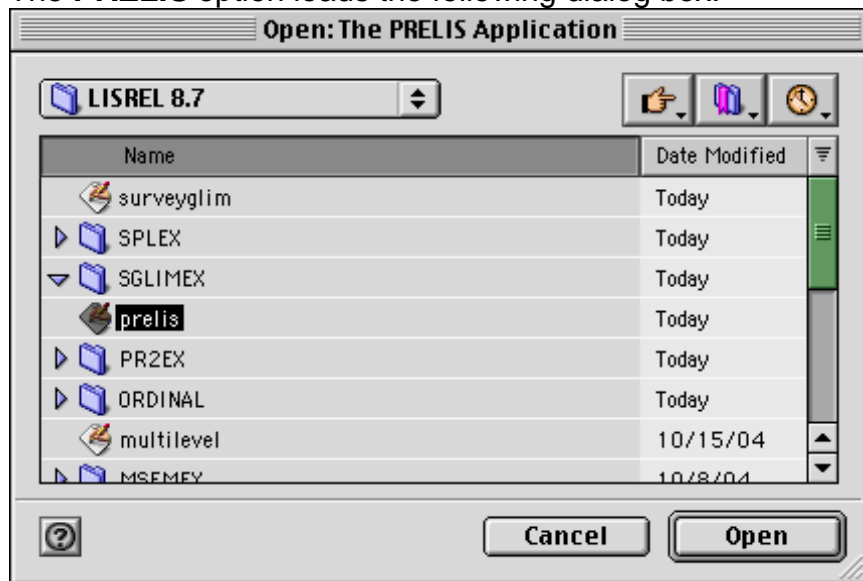
Edit	Start	Font	S
Can't Undo			⌘Z
Can't Redo			
Cut			⌘X
Copy			⌘C
Paste			⌘V
Clear			
Select All			⌘A

These options are the standard edit options of any standard Macintosh text editor such as SimpleText or TextEdit.

The options on the **Start** menu are:

Start	Font	Size	S
PRELIS			
LISREL			⌘L
MULTILEVEL			⌘M
SurveyGLIM			
Online Help			⌘H

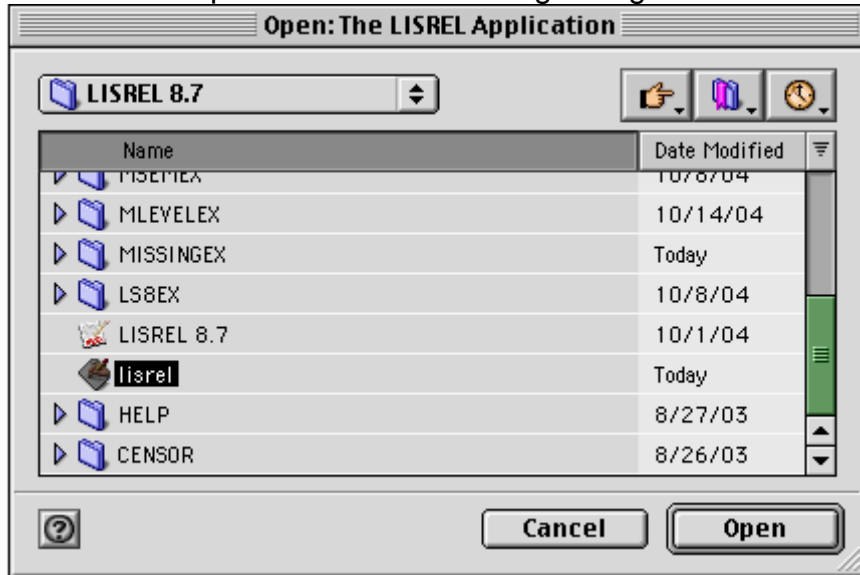
The **PRELIS** option loads the following dialog box.



Actions

- Locate the application **prelis** in the folder in which LISREL 8.7 for Mac OS 9 and X is installed.
- Select the application **prelis**.
- Click on the **Open** button to open **prelis**.

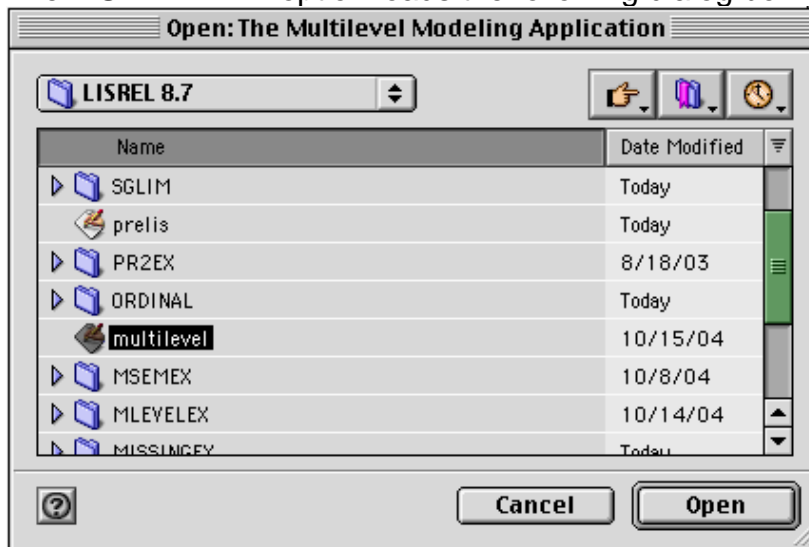
The **LISREL** option loads the following dialog box.



Actions

- Locate the application **lisrel** in the folder in which LISREL 8.7 for Mac OS 9 and X is installed.
- Select the application **lisrel**.
- Click on the **Open** button to open **lisrel**.

The **MULTILEVEL** option loads the following dialog box.

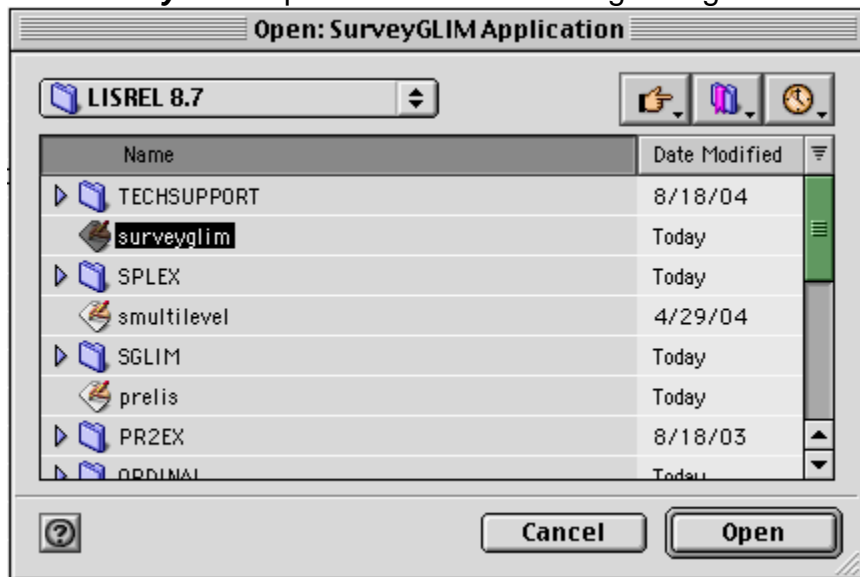


Actions

- Locate the application **multilevel** in the folder in which LISREL 8.7 for Mac OS 9 and X is installed.
- Select the application **multilevel**.

- Click on the **Open** button to open **multilevel**.

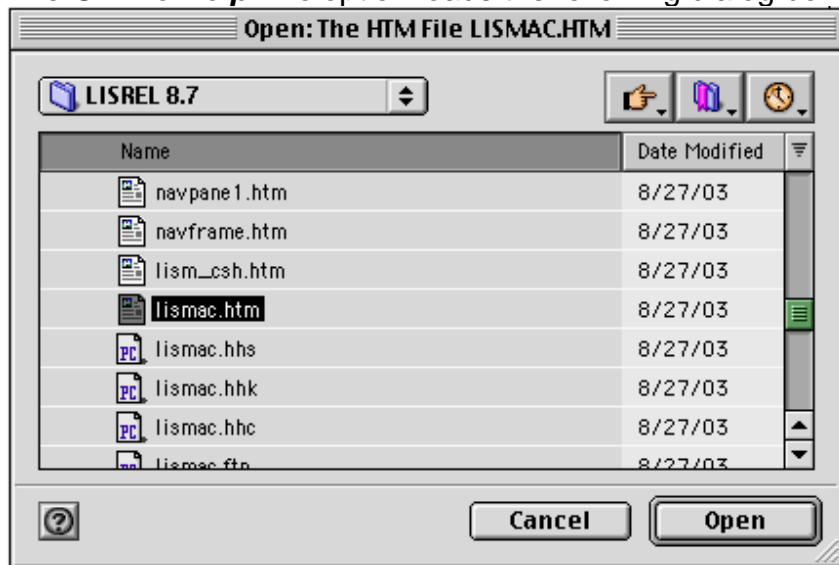
The **SurveyGLIM** option loads the following dialog box.



Actions

- Locate the application **surveyglim** in the folder in which LISREL 8.7 for Mac OS 9 and X is installed.
- Select the application **surveyglim**.
- Click on the **Open** button to open **surveyglim**.

The **Online Help File** option loads the following dialog box.



Actions

- Locate the file **LISMAC.HTM** in the **HELP** folder of the folder in which LISREL 8.7 for Mac OS 9 and X is installed.
- Select the file **LISMAC.HTM**.
- Click on the **Open** button to open **LISMAC.HTM**.

The options on the **Font** menu are:



This menu allows the user to set the font for LISREL 8.7 syntax and output files.

The options on the **Size** menu are:



This menu allows the user to set the font size for LISREL 8.7 syntax and output files.

The options on the **Style** menu are:

Style	Colour	Just
✓ Plain		⌘T
Bold		⌘B
<i>Italic</i>		⌘I
<u>Underline</u>		⌘U

This menu allows the user to set the character style for LISREL 8.7 syntax and output files.

The options on the **Colour** menu are:

Colour	Justificati
Red	⌘1
Green	⌘2
Blue	⌘3
✓ Black	⌘4
Colour Picker...	

This menu allows the user to set the font color for LISREL 8.7 syntax and output files.

The options on the **Justification** menu are:

Justification
Default
✓ Left
Right
Centre
Full
Force Full

This menu allows the user to set the paragraph justification for LISREL 8.7 syntax and output files.

The options on the **Window** menu are:

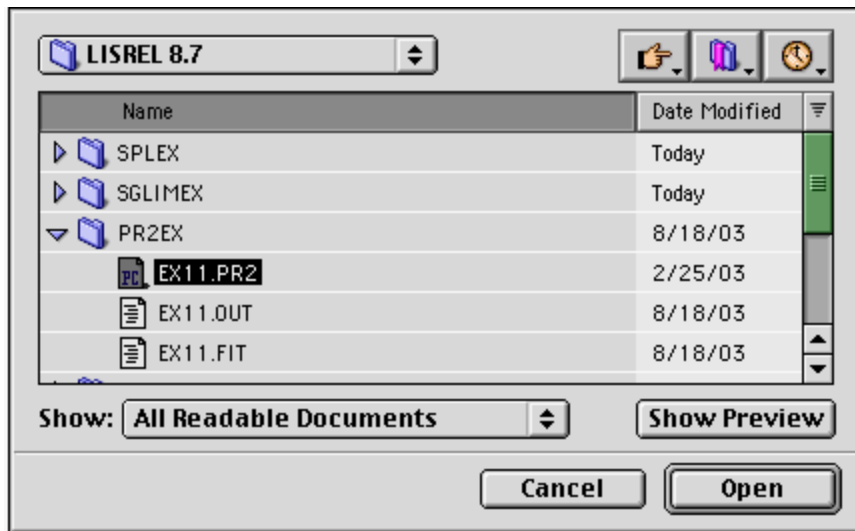
Window	Help	11:2
Collapse Window		⌘M
Arrange in Front		
✓ New Syntax File		

This menu allows the user to manage the open windows of **LISREL 8.7**.

4. Submitting a PRELIS Syntax File

The following stepwise procedure may be used to process the PRELIS syntax file **EX11.PR2** with LISREL 8.7.

- Select the **PRELIS** option on the **Start** menu to load the **Open: The PRELIS Application** dialog box.
- Locate the application **prelis** in the folder in which LISREL 8.7 for Mac OS 9 and X is installed.
- Select the application **prelis**.
- Click on the **Open** button to load the **prelis Open** dialog box.
- Locate the file **EX11.PR2**.
- Select the file **EX11.PR2** to produce the following dialog box.



- Click on the **Open** button to open the following text editor window.

DATE: 10/19/2004

TIME: 15:58

P R E L I S 2.71

BY

Karl G. Jireskog & Dag Sirhom

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The following lines were read from file EX11.PR2:

EXAMPLE 11: TEST OF FIXED-X

DA NI=4

RA=EX11.RAW

FI 3 4

OU MA=CM AC=DATA.ACC PA

Total Sample Size = 400

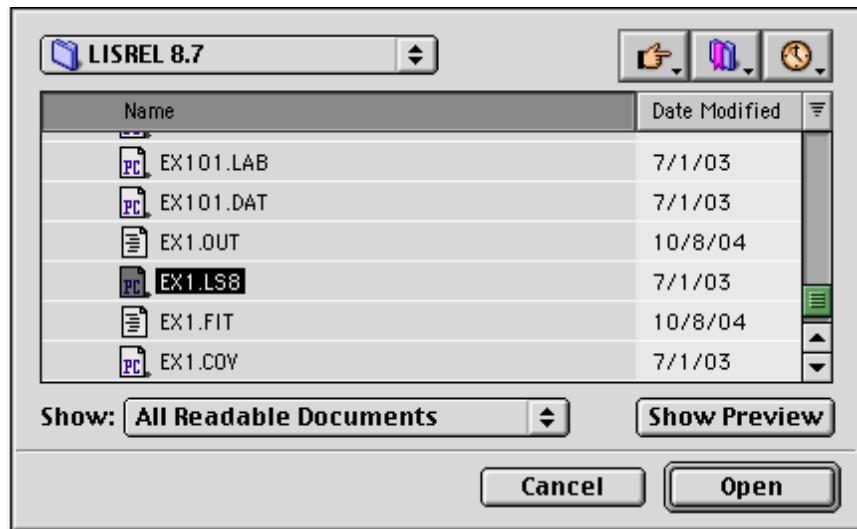
Univariate Probit Regression for VAR 1

Standard Parameterization

5. Submitting a LISREL Syntax File

The following steps may be followed to process the LISREL syntax file **EX1.LS8** with LISREL 8.7.

- Select the **LISREL** option on the **Start** menu to load the **Open: The LISREL Application** dialog box.
- Locate the application **lisrel** in the folder in which LISREL 8.7 for Mac OS 9 and X is installed.
- Select the application **lisrel**.
- Click on the **Open** button to load the **lisrel Open** dialog box.
- Locate the file **EX1.LS8**.
- Select the file **EX1.LS8** to produce the following dialog box.



- Click on the **Open** button to open the following text editor window.

DATE: 10/19/2004
TIME: 15:59

L I S R E L 8.71

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The following lines were read from file EX1.LS8:

HYPOTHETICAL MODEL ESTIMATED BY ML
DA NI=11 NO=100
CM SY FI=EX1.COV
MO NY=4 NX=7 NE=2 NK=3 BE=FU PS=SY,FR
FR LY 2 1 LY 4 2 LX 2 1 LX 3 1 LX 3 2 LX 5 2 LX 7 3 BE 2 1 BE 1 2
FI GA 1 3 GA 2 2
VA 1 LY 1 1 LY 3 2 LX 1 1 LX 4 2 LX 6 3
PD
OU MI RS EF MR SS SC

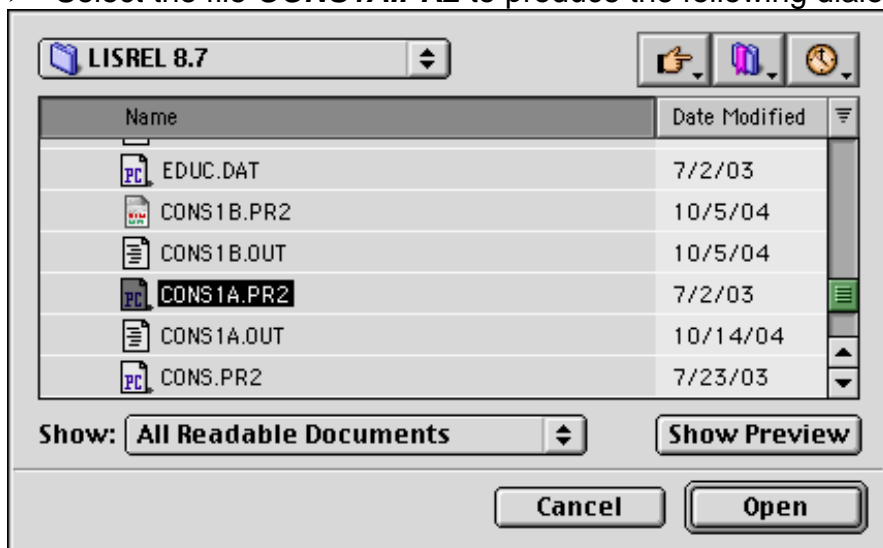
HYPOTHETICAL MODEL ESTIMATED BY ML

6. Submitting a MULTILEVEL Syntax File

The following stepwise procedure may be used to process the MULTILEVEL syntax file **CONS.PR2** with LISREL 8.7.

Generating CONS1A.PSF

- Select the **PRELIS** option on the **Start** menu to load the **Open: The PRELIS Application** dialog box.
- Locate the application **prelis** in the folder in which LISREL 8.7 for Mac OS 9 and X is installed.
- Select the application **prelis**.
- Click on the **Open** button to load the **prelis Open** dialog box.
- Locate the file **CONS1A.PR2**.
- Select the file **CONS1A.PR2** to produce the following dialog box.



- Click on the **Open** button to open the following text editor window.

```
CONS1A.OUT

DATE: 10/19/2004
TIME: 16:54

PRELIS 2.71

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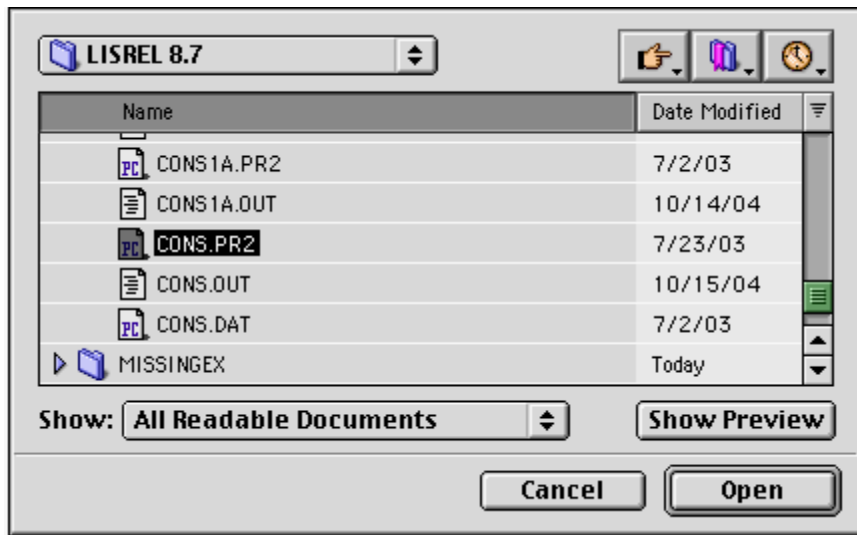
The following lines were read from file CONS1A.PR2:

!PRELIS SYNTAX: Can be edited

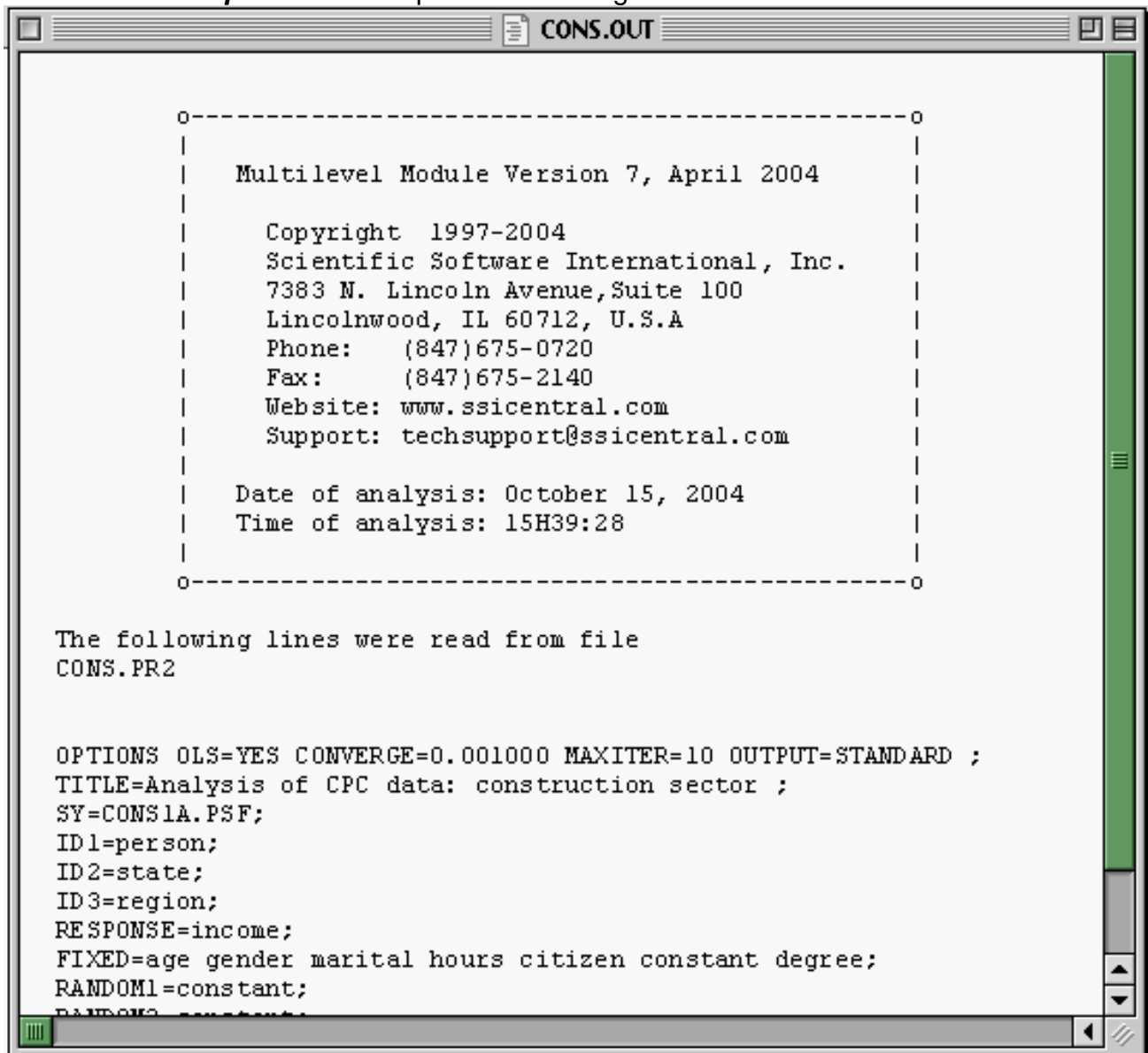
!Contents of PSFFILE:
!-----
DA NI=11 NO=0 MI= -999999 TR=PA
LA
region state age gender marital hours citizen person
constant degree income
RA=CONS.DAT
CO region
CO state
CO age
CO gender
CO marital
CO hours
CO citizen
CO person
CO constant
```

Multilevel Modeling

- Select the **MULTILEVEL** option on the **Start** menu to load the **Open: The Multilevel Modeling Application** dialog box.
- Locate the application **multilevel** in the folder in which LISREL 8.7 for Mac OS 9 and X is installed.
- Select the application **multilevel**.
- Click on the **Open** button to load the **multilevel Open** dialog box.
- Locate the file **CONS.PR2**.
- Select the file **CONS.PR2** to produce the following dialog box.



- Click on the **Open** button to open the following text editor window.

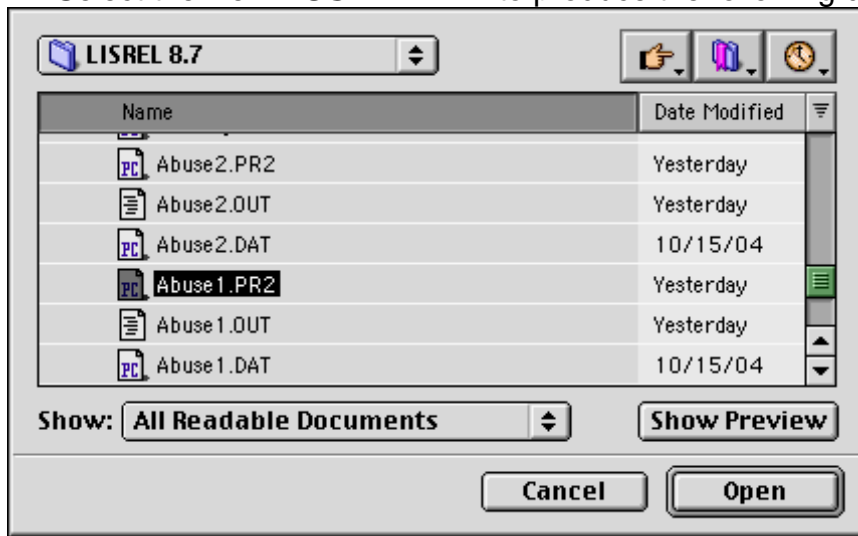


7. Submitting a SurveyGLIM Syntax File

The following stepwise procedure may be used to process the MULTILEVEL syntax file **GLIMEX1.PR2** with LISREL 8.7.

Generating ABUSE1.PSF

- Select the **PRELIS** option on the **Start** menu to load the **Open: The PRELIS Application** dialog box.
- Locate the application **prelis** in the folder in which LISREL 8.7 for Mac OS 9 and X is installed.
- Select the application **prelis**.
- Click on the **Open** button to load the **prelis Open** dialog box.
- Locate the file **ABUSE1A.PR2**.
- Select the file **ABUSE 1A.PR2** to produce the following dialog box.



- Click on the **Open** button to open the following text editor window.

```

Abuse1.0UT

DATE: 10/19/2004
TIME: 16:52

PRELIS 2.71

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The following lines were read from file Abuse1.PR2:

DA NI=6 NO=2214
LA
depr sex race_d CENREG FACTYPE A2TWA0
RA=Abuse1.DAT
CO ALL
OU MA=CM RA=Abuse1.PSF XM

Total Sample Size = 2214

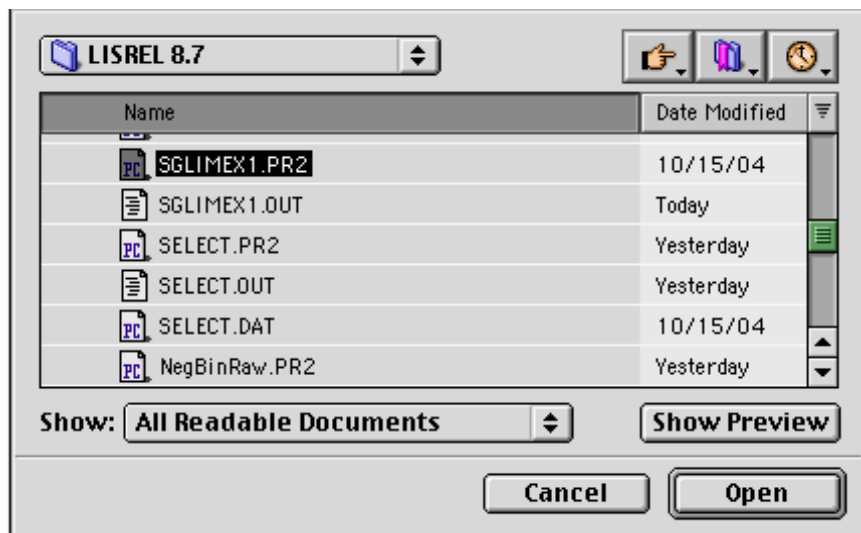
Univariate Summary Statistics for Continuous Variables

Variable      Mean    St. Dev.    T-Value    Skewness    Kurtosis    Minimum    Freq.    Max
-----
depr          0.411    0.492    39.298    0.362    -1.871    0.000    1304    1
sex           0.288    0.453    29.931    0.936    -1.125    0.000    1576    1
race_d       0.307    0.461    31.321    0.837    -1.301    0.000    1534    1

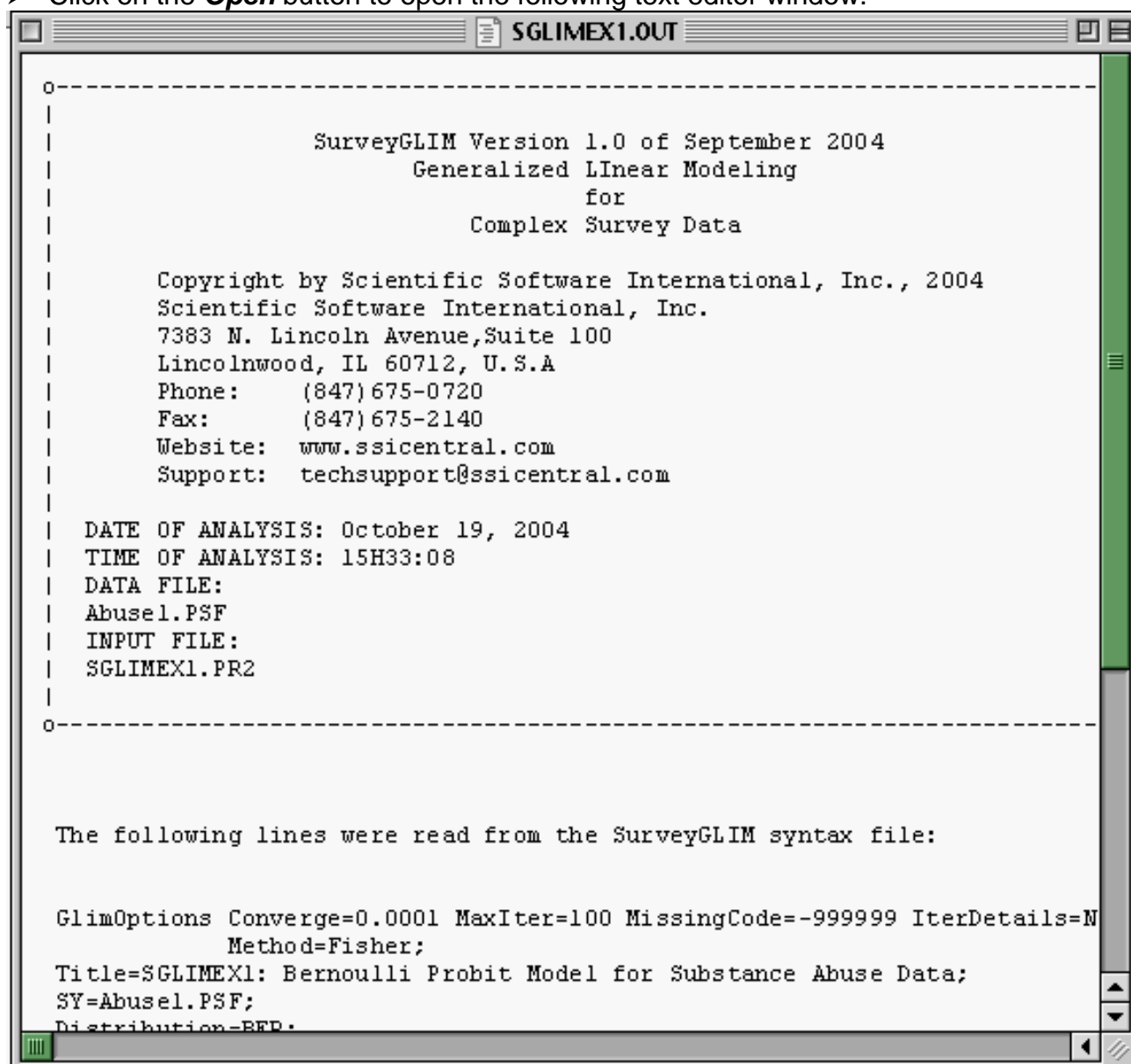
```

Generalized Linear Modeling

- Select the **SurveyGLIM** option on the **Start** menu to load the **Open: The SurveyGLIM Modeling Application** dialog box.
- Locate the application **surveyglm** in the folder in which LISREL 8.7 for Mac OS 9 and X is installed.
- Select the application **surveyglm**.
- Click on the **Open** button to load the **surveyglm Open** dialog box.
- Locate the file **SGLIMEX1.PR2** in the **SGLIMEX** folder.
- Select the file **SGLIMEX1.PR2** to produce the following dialog box.



- Click on the **Open** button to open the following text editor window.

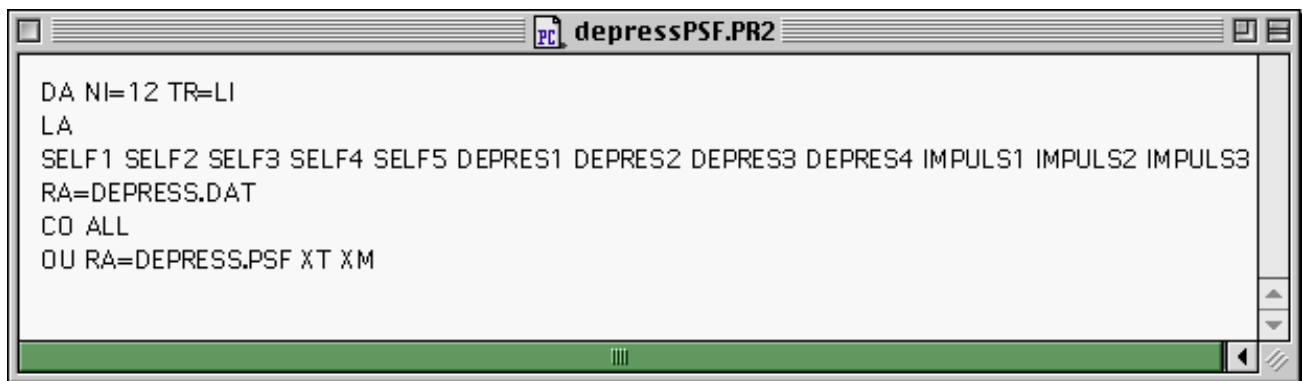


8. Fitting a Measurement Model to Raw Data

The text data file DEPRESS.DAT contains 204 observations of 12 continuous indicators of three latent variables. More specifically, the first 5 indicators (SELF1 to SELF5) are indicators of the latent variable *Self-esteem*, DEPRES1 to DEPRES4 are indicators of the latent variable *Depressiveness* and IMPULS1 to IMPULS3 are indicators of the latent variable *Impulsiveness*. The theoretical measurement model is a CFA model that specifies that the 12 continuous indicators are indeed indicators of *Self-esteem*, *Depressiveness* and *Impulsiveness*. A step-by-step procedure to fit this measurement model to the text data set follows.

Creating DEPRESS.PSF

- Select the **New** option on the **File** menu to load the **New Syntax File** window.
- Enter the following commands one by one.



```
DA NI=12 TR=LI
LA
SELF1 SELF2 SELF3 SELF4 SELF5 DEPRES1 DEPRES2 DEPRES3 DEPRES4 IMPULS1 IMPULS2 IMPULS3
RA=DEPRESS.DAT
CO ALL
OU RA=DEPRESS.PSF XT XM
```

Line 1 specifies that 12 variables are to be read (NI=12) and that list wise deletion should be applied to missing values (TR=LI).

Lines 2-3 specify the labels for the 12 observed variables.

Line 4 specifies the name of the text data file.

Line 5 specifies that all variables are continuous.

Line 6 specifies that the raw data in the text data file should be written to the PSF (binary file) **DEPRESS.PSF**.

- Select the **Save As** option on the **File** menu to load the **Save As** dialog box.
- Enter the name **DEPRESSPSF.PR2** for the PRELIS syntax file.
- Click on the **Save** button.
- Close the syntax file window.
- Select the **PRELIS** option on the **Start** menu to load the **Open: The PRELIS Application** dialog box.
- Locate the application **prelis** in the folder in which LISREL 8.7 for Mac OS 9 and X is installed.
- Select the application **prelis**.
- Click on the **Open** button to open **prelis**.
- Locate the PRELIS syntax file **DEPRESSPSF.PR2**.
- Click on the **Open** button to open the following output window.

depressPSF.OUT

Total Sample Size = 204

Univariate Summary Statistics for Continuous Variables

Variable	Mean	St. Dev.	T-Value	Skewness	Kurtosis	Minimum	Freq.	Maximum
SELF1	1.897	1.377	19.679	-0.030	-1.272	0.000	47	4.000
SELF2	1.716	1.312	18.675	0.196	-1.100	0.000	48	4.000
SELF3	1.824	1.278	20.377	0.035	-1.109	0.000	41	4.000
SELF4	2.221	1.381	22.969	-0.222	-1.165	0.000	32	4.000
SELF5	2.142	1.454	21.050	-0.202	-1.345	0.000	41	4.000
DEPRES1	2.059	1.406	20.915	-0.148	-1.293	0.000	41	4.000
DEPRES2	1.034	1.273	11.608	0.920	-0.425	0.000	104	4.000
DEPRES3	1.961	1.441	19.431	0.059	-1.347	0.000	43	4.000
DEPRES4	2.039	1.424	20.452	-0.028	-1.354	0.000	38	4.000
IMPULS1	0.348	0.813	6.112	2.498	5.793	0.000	165	4.000
IMPULS2	0.196	0.596	4.697	3.569	13.975	0.000	179	4.000
IMPULS3	1.000	1.170	12.205	0.950	-0.182	0.000	95	4.000

Test of Univariate Normality for Continuous Variables

Variable	Skewness		Kurtosis		Skewness and Kurtosis	
	Z-Score	P-Value	Z-Score	P-Value	Chi-Square	P-Value
SELF1	-0.182	0.856	-12.082	0.000	146.003	0.000
SELF2	1.160	0.246	-7.536	0.000	58.141	0.000
SELF3	0.210	0.834	-7.704	0.000	59.395	0.000
SELF4	-1.313	0.189	-8.868	0.000	80.368	0.000
SELF5	-1.196	0.232	-15.835	0.000	252.177	0.000
DEPRES1	-0.883	0.377	-12.987	0.000	169.446	0.000
DEPRES2	4.794	0.000	-1.466	0.143	25.136	0.000
DEPRES3	0.354	0.723	-16.018	0.000	256.705	0.000
DEPRES4	-0.169	0.865	-16.484	0.000	271.735	0.000
IMPULS1	9.239	0.000	5.749	0.000	118.402	0.000
IMPULS2	11.015	0.000	7.532	0.000	178.066	0.000
IMPULS3	4.916	0.000	-0.459	0.646	24.378	0.000

Fitting the measurement model

- Select the **New** option on the **File** menu to load the **New Syntax File** window.
- Enter the following commands one by one.

```

depress1.spl
Raw Data from File DEPRESS.PSF
Latent Variables
selfest depress impuls
Relationships
SELF1-SELF5 = selfest
DEPRES1-DEPRES4 = depress
IMPULS1-IMPULS3 = impuls
Lisrel Output: ND=3 SC
Path Diagram
End of Problem

```

Line 1 specifies the source for the raw data file.

Lines 2-3 specify the labels for the 3 latent variables.

Lines 4-7 specify the measurement model for the 3 latent variables.

Line 8 specifies that the results should be reported in the form of the LISREL model for the measurement model.

- Select the **Save As** option on the **File** menu to load the **Save As** dialog box.
- Enter the name **DEPRESS1.SPL** for the SIMPLIS syntax file.
- Click on the **Save** button.
- Close the syntax file window.
- Select the **LISREL** option on the **Start** menu to load the **Open: The LISREL Application** dialog box.
- Locate the application **lisrel** in the folder in which LISREL 8.7 for Mac OS 9 and X is installed.
- Select the application **lisrel**.
- Click on the **Open** button to open **lisrel**.
- Locate the PRELIS syntax file **DEPRESS1.SPL**.
- Click on the **Open** button to open the following output window.

LISREL Estimates (Maximum Likelihood)

LAMBDA-X			
	selfest	depress	impuls
SELF1	0.984 (0.086) 11.384	- -	- -
SELF2	1.031 (0.079) 13.017	- -	- -
SELF3	0.984 (0.078) 12.635	- -	- -
SELF4	1.109 (0.082) 13.457	- -	- -
SELF5	1.248 (0.084) 14.914	- -	- -
DEPRES1	- -	1.233 (0.081) 15.198	- -
DEPRES2	- -	0.875 (0.082) 10.710	- -
DEPRES3	- -	1.064 (0.090) 11.798	- -

9. Fitting a Structural Equation Model to raw data

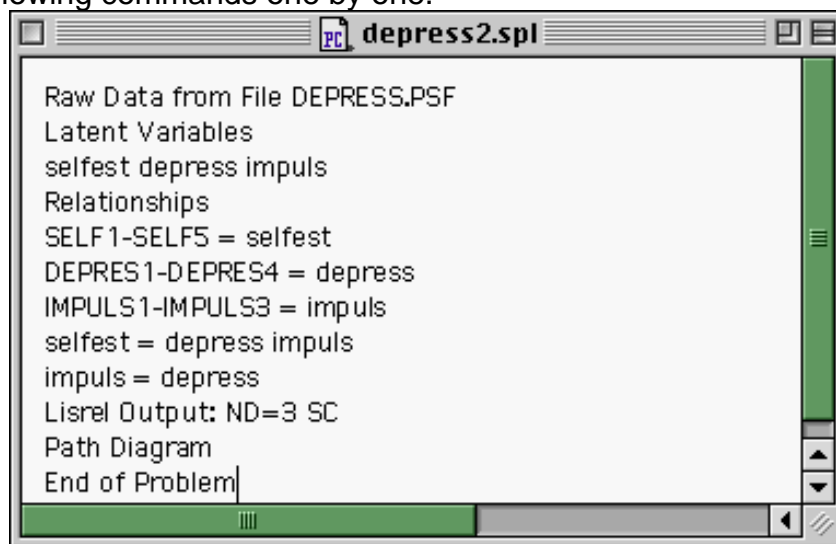
The text data file DEPRESS.DAT contains 204 observations of 12 continuous indicators of three latent variables. More specifically, the first 5 indicators (SELF1 to SELF5) are indicators of the latent variable *Self-esteem*, DEPRES1 to DEPRES4 are indicators of the latent variable *Depressiveness* and IMPULS1 to IMPULS3 are indicators of the latent variable *Impulsiveness*. The theoretical measurement model is a CFA model that specifies that the 12 continuous indicators are indeed indicators of *Self-esteem*, *Depressiveness* and *Impulsiveness*. One possible structural model for the three latent variables is a model that suggests that *Depressiveness* and *Impulsiveness* are correlated antecedents of *Self-esteem*. A step-by-step procedure to fit this latent variable model to the text data set follows.

Creating DEPRESS.PSF

Use the steps in section 7 to create of the PSF *DEPRESS.PSF* if it has not yet been created.

Fitting the structural equation model

- Select the **New** option on the **File** menu to load the **New Syntax File** window.
- Enter the following commands one by one.



```
Raw Data from File DEPRESS.PSF
Latent Variables
selfest depress impuls
Relationships
SELF1-SELF5 = selfest
DEPRES1-DEPRES4 = depress
IMPULS1-IMPULS3 = impuls
selfest = depress impuls
impuls = depress
Lisrel Output: ND=3 SC
Path Diagram
End of Problem
```

Line 1 specifies the source for the raw data file.

Lines 2-3 specify the labels for the 3 latent variables.

Lines 4-7 specify the measurement model for the 3 latent variables.

Lines 8-9 specify the structural model for the latent variables.

Line 10 specifies that the results should be reported in the form of the LISREL model for the structural equation model.

- Select the **Save As** option on the **File** menu to load the **Save As** dialog box.
- Enter the name **DEPRESS2.SPL** for the SIMPLIS syntax file.
- Click on the **Save** button.
- Close the syntax file window.
- Select the **LISREL** option on the **Start** menu to load the **Open: The LISREL Application** dialog box.
- Locate the application **lisrel** in the folder in which LISREL 8.7 for Mac OS 9 and X is installed.

- Select the application *lisrel*.
- Click on the **Open** button to open *lisrel*.
- Locate the PRELIS syntax file *DEPRESS2.SPL*.
- Click on the **Open** button to open the following output window.

```

depress2.OUT
LISREL Estimates (Maximum Likelihood)

      LAMBDA-Y
           selfest      impuls
           -----      - - -
SELF1      0.984      - -
SELF2      1.031      - -
           (0.096)
           10.689
SELF3      0.984      - -
           (0.094)
           10.476
SELF4      1.109      - -
           (0.102)
           10.926
SELF5      1.248      - -
           (0.107)
           11.643
IMPULS1      - -      0.604
IMPULS2      - -      0.393
                   (0.077)
                   5.067
IMPULS3      - -      0.578
                   (0.119)
                   4.860

      LAMBDA-X
depress

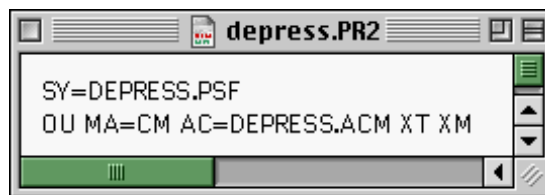
```

10. Robust Maximum Likelihood

Browne (1987) formulated a Robust Maximum Likelihood (RML) method for factor analysis and related models. Satorra & Bentler (1988) extended this method by providing a correct Chi-square test statistic. This method is available in LISREL 8.7 for Mac OS 9 and X and the associated formulae are provided in Jöreskog et al (2001). To implement this method, the user needs to compute the Asymptotic Covariance Matrix (ACM) of the sample variances and covariances. A step-by-step procedure to implement the RML method in LISREL 8.7 for Mac OS 9 and X for the structural equation model of section 4 may be described as follows.

Creating DEPRESS.DSF

- Select the **New** option on the **File** menu to load the **New Syntax File** window.
- Enter the following commands one by one.



Line 1 specifies the source for the raw data file.

Line 2 specifies that the sample covariance matrix should be computed (MA=CM) and that the estimated asymptotic covariance matrix of the sample variances and covariances should be computed and written to the binary file **DEPRESS.ACM**.

- Select the **Save As** option on the **File** menu to load the **Save As** dialog box.
- Enter the name **DEPRESS.PR2** for the PRELIS syntax file.
- Click on the **Save** button.
- Close the syntax file window.
- Select the **PRELIS** option on the **Start** menu to load the **Open: The PRELIS Application** dialog box.
- Locate the application **prelis** in the folder in which LISREL 8.7 for Mac OS 9 and X is installed.
- Select the application **prelis**.
- Click on the **Open** button to open **prelis**.
- Locate the PRELIS syntax file **DEPRESS.PR2**.
- Click on the **Open** button to open the following output window.

depress.OUT

Covariance Matrix

	SELF1	SELF2	SELF3	SELF4	SELF5	DEPRES1
SELF1	1.896					
SELF2	1.123	1.722				
SELF3	1.090	1.073	1.634			
SELF4	1.013	1.176	1.093	1.907		
SELF5	1.177	1.228	1.143	1.427	2.113	
DEPRES1	0.947	1.017	1.035	1.233	1.499	1.977
DEPRES2	0.644	0.650	0.696	0.785	1.044	1.052
DEPRES3	0.799	0.821	0.811	0.876	1.075	1.352
DEPRES4	0.945	0.942	0.943	0.903	1.270	1.278
IMPULS1	0.149	0.129	0.116	0.110	0.093	0.063
IMPULS2	0.035	0.061	-0.029	-0.034	0.031	-0.002
IMPULS3	0.458	0.512	0.409	0.453	0.591	0.567

Covariance Matrix

	DEPRES2	DEPRES3	DEPRES4	IMPULS1	IMPULS2	IMPULS3
DEPRES2	1.620					
DEPRES3	0.898	2.077				
DEPRES4	1.068	1.253	2.028			
IMPULS1	0.106	-0.036	0.060	0.662		
IMPULS2	0.097	0.023	0.017	0.247	0.355	
IMPULS3	0.473	0.512	0.532	0.325	0.217	1.369

Means

	SELF1	SELF2	SELF3	SELF4	SELF5	DEPRES1
	1.897	1.716	1.824	2.221	2.142	2.059

Means

	DEPRES2	DEPRES3	DEPRES4	IMPULS1	IMPULS2	IMPULS3

The Robust Maximum Likelihood method

- Select the **New** option on the **File** menu to load the **New Syntax File** window.
- Enter the following commands one by one.

```

System File from File DEPRESS.DSF
Latent Variables
selfest depress impuls
Relationships
SELF1-SELF5 = selfest
DEPRES1-DEPRES4 = depress
IMPULS1-IMPULS3 = impuls
selfest = depress impuls
impuls = depress
Lisrel Output: ND=3 SC ME=ML
Path Diagram
End of Problem

```

Line 1 specifies the source for the binary summary data file.
 Lines 2-3 specify the labels for the 3 latent variables.
 Lines 4-7 specify the measurement model for the 3 latent variables.
 Lines 8-9 specify the structural model for the latent variables.
 Line 10 specifies that the results should be reported in the form of the LISREL model for the structural equation model.

- Select the **Save As** option on the **File** menu to load the **Save As** dialog box.
- Enter the name **DEPRESS3.SPL** for the SIMPLIS syntax file.
- Click on the **Save** button.
- Close the syntax file window.
- Select the **LISREL** option on the **Start** menu to load the **Open: The LISREL Application** dialog box.
- Locate the application **lisrel** in the folder in which LISREL 8.7 for Mac OS 9 and X is installed.
- Select the application **lisrel**.
- Click on the **Open** button to open **lisrel**.
- Locate the PRELIS syntax file **DEPRESS3.SPL**.
- Click on the **Open** button to open the following output window.

```

Number of Iterations = 47

LISREL Estimates (Maximum Likelihood)

      LAMBDA-Y
           selfest      impuls
           -----      - - -
SELF1      0.984          - -
SELF2      1.031          - -
           (0.085)
           12.174
SELF3      0.984          - -
           (0.076)
           12.953
SELF4      1.109          - -
           (0.092)
           11.996
SELF5      1.248          - -
           (0.090)
           13.942

IMPULS1      - -          0.604
IMPULS2      - -          0.393
                       (0.109)
                       3.598
IMPULS3      - -          0.578
                       (0.154)
                       3.767

      LAMBDA-X
  
```

11. Weighted Least Squares

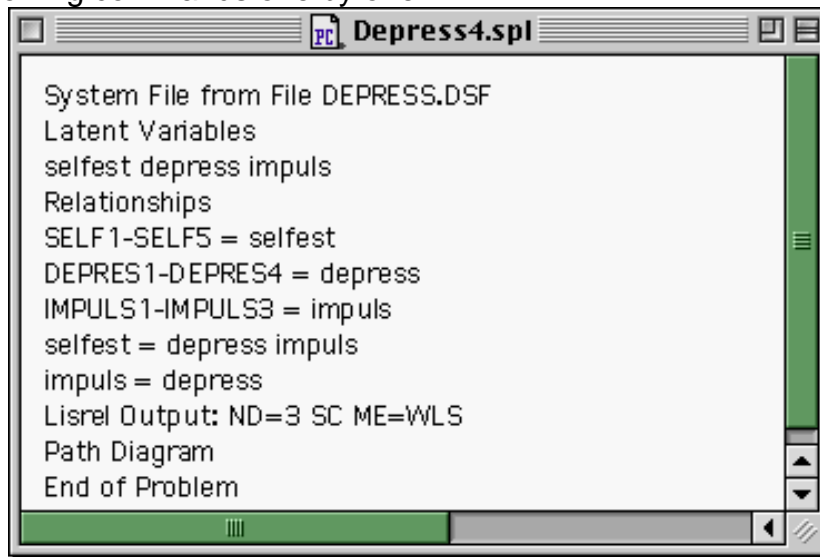
Browne (1982, 1984) formulated an Asymptotically Distribution Free (ADF) method for covariance structures. This method is implemented in LISREL 8.7 for Mac OS 9 and X as Weighted Least Squares (WLS) and extended to correlation structures. To implement this method, the user needs to compute the Asymptotic Covariance Matrix (ACM) of the sample variances and covariances or sample correlations. A step-by-step procedure to implement the WLS method in LISREL 8.7 for Mac OS 9 and X for the structural equation model of sections 4 and 5 may be described as follows.

Creating DEPRESS.DSF

Generate the Data System File (DSF) **DEPRESS.DSF** exactly as described in section 9 if it has not yet been generated.

The Weighted Least Squares method

- Select the **New** option on the **File** menu to load the **New Syntax File** window.
- Enter the following commands one by one.



```
System File from File DEPRESS.DSF
Latent Variables
selfest depress impuls
Relationships
SELF1-SELF5 = selfest
DEPRES1-DEPRES4 = depress
IMPULS1-IMPULS3 = impuls
selfest = depress impuls
impuls = depress
Lisrel Output: ND=3 SC ME=WLS
Path Diagram
End of Problem
```

Line 1 specifies the source for the binary summary data file.

Lines 2-3 specify the labels for the 3 latent variables.

Lines 4-7 specify the measurement model for the 3 latent variables.

Lines 8-9 specify the structural model for the latent variables.

Line 10 specifies that the results should be reported in the form of the LISREL model for the structural equation model.

- Select the **Save As** option on the **File** menu to load the **Save As** dialog box.
- Enter the name **DEPRESS4.SPL** for the SIMPLIS syntax file.
- Click on the **Save** button.
- Close the syntax file window.
- Select the **LISREL** option on the **Start** menu to load the **Open: The LISREL Application** dialog box.
- Locate the application **lisrel** in the folder in which LISREL 8.7 for Mac OS 9 and X is installed.
- Select the application **lisrel**.
- Click on the **Open** button to open **lisrel**.
- Locate the PRELIS syntax file **DEPRESS4.SPL**.
- Click on the **Open** button to open the following output window.

Depress4.OUT

LISREL Estimates (Weighted Least Squares)

LAMBDA-Y

	selfest	impuls
	-----	-----
SELF1	1.082	- -
SELF2	1.200 (0.063) 19.031	- -
SELF3	1.151 (0.056) 20.507	- -
SELF4	1.273 (0.071) 17.964	- -
SELF5	1.346 (0.067) 20.175	- -
IMPULS1	- -	0.221
IMPULS2	- -	0.098 (0.025) 3.857
IMPULS3	- -	0.775 (0.194) 3.983

LAMBDA-X

denress

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