OPEN Study: Regressing BMI on Log Potassium Density, Age and Gender 1

Maximum Likelihood Estimation using Proc Calis 10:41 Tuesday, September 18, 2018

The MEANS Procedure

Variable Label N Mean Std Dev Variance Minimum Maximum

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BMI BMI 484 27.8694241 5.2739397 27.8144404 17.3686496 50.9713506

AGE AGE 484 53.3842975 8.3005800 68.8996287 40.0000000 69.0000000

GENDER GENDER 484 0.4607438 0.4989723 0.2489734 0 1.0000000

ffq 483 0.5549682 0.2649959 0.0702229 -0.3581886 1.3082310

biom1 223 0.1617308 0.3958770 0.1567186 -1.7038878 1.0927605

biom2 216 0.1583842 0.3810054 0.1451651 -2.2376991 0.9894319

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The CALIS Procedure

Mean and Covariance Structures: Model and Initial Values

Modeling Information

Full Information Maximum Likelihood Estimation

Data Set WORK.OPEN

N Records Read 484

N Complete Records 212

N Incomplete Records 272

N Complete Obs 212

N Incomplete Obs 272

Model Type LINEQS

Analysis Means and Covariances

OPEN Study: Regressing BMI on Log Potassium Density, Age and Gender 3

Maximum Likelihood Estimation using Proc Calis 10:41 Tuesday, September 18, 2018

The CALIS Procedure

Mean and Covariance Structures: Optimization

Newton-Raphson Optimization with Line Search

Without Parameter Scaling

Parameter Estimates 20

Functions (Observations) 27

Optimization Start

Active Constraints 0 Objective Function 15.735405662

Max Abs Gradient Element 17.338499703

Objective Max Abs Slope of

Function Active Objective Function Gradient Step Search

Iter Restarts Calls Constraints Function Change Element Size Direction

1 0 5 0 15.30866 0.4267 3.0314 1.000 -1.199

2 0 8 0 15.27248 0.0362 0.5053 1.000 -0.0631

3 0 11 0 15.27146 0.00102 0.0286 1.000 -0.0018

4 0 14 0 15.27142 0.000037 0.00835 1.000 -601E-7

5 0 17 0 15.27142 1.962E-6 0.00264 1.000 -319E-8

6 0 20 0 15.27142 1.054E-7 0.000762 1.000 -171E-9

7 0 23 0 15.27142 5.665E-9 0.000180 1.000 -92E-10

8 0 26 0 15.27142 3.05E-10 0.000044 1.000 -49E-11

9 0 29 0 15.27142 1.64E-11 0.000010 1.000 -27E-12

10 0 32 0 15.27142 8.78E-13 2.37E-6 1.000 -14E-13

Optimization Results

Iterations 10 Function Calls 34

Jacobian Calls 11 Active Constraints 0

Objective Function 15.271418051 Max Abs Gradient Element 2.3696153E-6

Slope of Search Direction -1.42978E-12 Ridge 0

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The CALIS Procedure

Mean and Covariance Structures: Optimization

Convergence criterion (GCONV=1E-12) satisfied.

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The CALIS Procedure

Mean and Covariance Structures: Full Information Maximum Likelihood Estimation

Fit Summary

Modeling Info Number of Complete Observations 212

Number of Incomplete Observations 272

Number of Variables 6

Number of Moments 27

Number of Parameters 20

Number of Active Constraints 0

Saturated Model Estimation FIML

Saturated Model Function Value 15.2542

Saturated Model -2 Log-Likelihood 7383.0523

Baseline Model Estimation Converged

Baseline Model Function Value 15.7093

Baseline Model -2 Log-Likelihood 7603.2962

Baseline Model Chi-Square 220.2439

Baseline Model Chi-Square DF 15

Pr > Baseline Model Chi-Square <.0001

Absolute Index Fit Function 15.2714

-2 Log-Likelihood 7391.3663

Chi-Square 8.3141

Chi-Square DF 7

Pr > Chi-Square 0.3057

Z-Test of Wilson & Hilferty 0.5094

Hoelter Critical N 818

Root Mean Square Residual (RMR) 0.0288

Standardized RMR (SRMR) 0.0263

Goodness of Fit Index (GFI) 0.9991

Parsimony Index Adjusted GFI (AGFI) 0.9966

Parsimonious GFI 0.4663

RMSEA Estimate 0.0197

RMSEA Lower 90% Confidence Limit 0.0000

RMSEA Upper 90% Confidence Limit 0.0615

Probability of Close Fit 0.8595

Akaike Information Criterion 7431.3663

Bozdogan CAIC 7535.0080

Schwarz Bayesian Criterion 7515.0080

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The CALIS Procedure

Mean and Covariance Structures: Full Information Maximum Likelihood Estimation

Fit Summary

Parsimony Index McDonald Centrality 0.9986

Incremental Index Bentler Comparative Fit Index 0.9936

Bentler-Bonett NFI 0.0279

Bentler-Bonett Non-normed Index 0.9863

Bollen Normed Index Rho1 0.9191

Bollen Non-normed Index Delta2 0.9938

James et al. Parsimonious NFI 0.4491

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The CALIS Procedure

Mean and Covariance Structures: Full Information Maximum Likelihood Estimation

Linear Equations

AGE = 53.3843(\*\*) intercept + 1.0000 d\_age

GENDER = 0.4607(\*\*) intercept + 1.0000 d\_gender

f\_x = -0.3396(\*\*) intercept + 0.00853(\*\*) AGE + 0.0707(ns) GENDER + 1.0000 d\_phi

BMI = 24.0404(\*\*) intercept + -7.1898(\*\*) f\_x + 0.0920(\*\*) AGE + -0.0332(ns) GENDER

+ 1.0000 d\_epsilon

ffq = 0.3243(\*\*) intercept + 0.2996(\*\*) f\_x + 0.00278(ns) AGE + 0.0823(\*\*) GENDER

+ 1.0000 d\_u

biom1 = 0 intercept + 1.0000 f\_x + 1.0000 d\_delta1

biom2 = 0 intercept + 1.0000 f\_x + 1.0000 d\_delta2

Effects in Linear Equations

Standard

Variable Predictor Parameter Estimate Error t Value Pr > |t|

AGE intercept mean\_age 53.38430 0.37691 141.6 <.0001

GENDER intercept mean\_gender 0.46074 0.02266 20.3355 <.0001

f\_x intercept gamma0 -0.33963 0.13892 -2.4447 0.0145

f\_x AGE gamma1 0.00853 0.00251 3.4030 0.0007

f\_x GENDER gamma2 0.07066 0.04330 1.6320 0.1027

BMI intercept beta0 24.04043 1.70076 14.1351 <.0001

BMI f\_x beta1 -7.18985 1.24559 -5.7723 <.0001

BMI AGE beta2 0.09196 0.03173 2.8979 0.0038

BMI GENDER beta3 -0.03319 0.50749 -0.0654 0.9479

ffq intercept alpha0 0.32435 0.08203 3.9540 <.0001

ffq f\_x alpha1 0.29965 0.06038 4.9626 <.0001

ffq AGE alpha2 0.00278 0.00153 1.8241 0.0681

ffq GENDER alpha3 0.08226 0.02476 3.3224 0.0009

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The CALIS Procedure

Mean and Covariance Structures: Full Information Maximum Likelihood Estimation

Effects in Linear Equations

Standard

Variable Predictor Parameter Estimate Error t Value Pr > |t|

biom1 intercept 0

biom1 f\_x 1.00000

biom2 intercept 0

biom2 f\_x 1.00000

Estimates for Variances of Exogenous Variables

Variable Standard

Type Variable Parameter Estimate Error t Value Pr > |t|

Error d\_age var\_age 68.75727 4.41991 15.5563 <.0001

d\_gender var\_gender 0.24846 0.01597 15.5559 <.0001

Disturbance d\_phi var\_phi 0.08755 0.01108 7.8999 <.0001

Error d\_epsilon var\_epsilon 23.08463 1.88919 12.2194 <.0001

d\_u var\_u 0.05792 0.00442 13.0992 <.0001

d\_delta1 var\_delta 0.05569 0.00528 10.5377 <.0001

d\_delta2 var\_delta 0.05569 0.00528 10.5377 <.0001

Covariances Among Exogenous Variables

Standard

Var1 Var2 Parameter Estimate Error t Value Pr > |t|

d\_age d\_gender cov\_age\_gender -0.28037 0.18830 -1.4889 0.1365

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The CALIS Procedure

Mean and Covariance Structures: Full Information Maximum Likelihood Estimation

Additional Parameters

Standard

Type Parameter Estimate Error t Value Pr > |t|

Independent beta0 24.04043 1.70076 14.1351 <.0001

beta1 -7.18985 1.24559 -5.7723 <.0001

beta2 0.09196 0.03173 2.8979 0.0038

beta3 -0.03319 0.50749 -0.0654 0.9479

alpha0 0.32435 0.08203 3.9540 <.0001

alpha1 0.29965 0.06038 4.9626 <.0001

alpha2 0.00278 0.00153 1.8241 0.0681

alpha3 0.08226 0.02476 3.3224 0.0009

gamma0 -0.33963 0.13892 -2.4447 0.0145

gamma1 0.00853 0.00251 3.4030 0.0007

gamma2 0.07066 0.04330 1.6320 0.1027

var\_epsilon 23.08463 1.88919 12.2194 <.0001

var\_phi 0.08755 0.01108 7.8999 <.0001

var\_u 0.05792 0.00442 13.0992 <.0001

mean\_age 53.38430 0.37691 141.6 <.0001

mean\_gender 0.46074 0.02266 20.3355 <.0001

var\_age 68.75727 4.41991 15.5563 <.0001

var\_gender 0.24846 0.01597 15.5559 <.0001

cov\_age\_gender -0.28037 0.18830 -1.4889 0.1365