

Is Timing Everything? Measurement Timing and the Ability to Accurately Model Longitudinal Data

by

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in

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ABSTRACT

IS TIMING EVERYTHING? MEASUREMENT TIMING AND THE ABILITY TO
ACCURATELY MODEL LONGITUDINAL DATA

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David Stanley

The preface pretty much says it all. This is additional content. The preface pretty much says it all. This is additional content. The preface pretty much says it all. This is additional content. The preface pretty much says it all. This is additional content. The preface pretty much says it all. This is additional content.

DEDICATION

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ACKNOWLEDGEMENTS

I want to thank a few people. You can have a dedication here if you wish. You can have a dedication here if you wish. You can have a dedication here if you wish. You can have a dedication here if you wish. You can have a dedication here if you wish. You can have a dedication here if you wish. You can have a dedication here if you wish.

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TABLE OF CONTENTS

Abstract	ii
Dedication	iii
Acknowledgements	iv
Table of Contents.....	v
List of Tables	x
List of Figures	xi
List of Appendices	xii
1 thesisdown::thesis-gitbook: default.....	1
1.1 The Need to Conduct Longitudinal Research	1
1.2 Understanding Patterns of Change That Emerge Over Time	1
1.3 Challenges Involved in Conducting Longitudinal Research.....	1
1.3.1 Number of Measurements	1
1.3.2 Spacing of Measurements	1
1.3.3 Time Structuredness	1
1.3.3.1 Time-Structured Data	1
1.3.3.2 Time-Unstructured Data	1
1.3.4 Summary.....	1
1.4 Using Simulations To Assess Modelling Accuracy	1
1.5 Systematic Review of Simulation Literature	1
1.5.1 Systematic Review Methodology	1
1.5.2 Systematic Review Results.....	1
1.5.3 Next Steps.....	1
1.6 Methods of Modelling Nonlinear Patterns of Change Over Time	1
1.7 Overview of Simulation Experiments.....	1
2 Experiment 1	1
2.1 Methods	3
2.1.1 Variables Used in Simulation Experiment.....	3
2.1.1.1 Independent Variables	3
2.1.1.1.1 Spacing of Measurements	3

2.1.1.1.2	Number of Measurements.....	3
2.1.1.1.3	Population Values Set for The Fixed-Effect Days-to-Halfway Elevation Parameter β_{fixed} (Nature of Change)	3
2.1.1.2	Constants	3
2.1.1.3	Dependent Variables.....	3
2.1.1.3.1	Convergence Success Rate	3
2.1.1.3.2	Bias	3
2.1.1.3.3	Precision	3
2.1.2	Overview of Data Generation.....	3
2.1.2.1	Data Generation.....	3
2.1.2.1.1	Function Used to Generate Each Data Set.....	3
2.1.2.1.2	Population Values Used for Function Parameters.....	3
2.1.3	Modelling of Each Generated Data Set	3
2.1.4	Analysis of Data Modelling Output and Accompanying Visualizations	3
2.1.4.1	Analysis of Convergence Success Rate.....	3
2.1.4.2	Analysis and Visualization of Bias	3
2.1.4.3	Analysis and Visualization of Precision	3
2.1.4.3.1	Effect Size Computation for Precision	3
2.2	Results and Discussion.....	3
2.2.1	Framework for Interpreting Results.....	3
2.2.2	Pre-Processing of Data and Model Convergence	3
2.2.3	Equal Spacing.....	3
2.2.3.1	Nature of Change That Leads to Highest Modelling Accuracy.....	3
2.2.3.2	Bias.....	3
2.2.3.3	Precision	3
2.2.3.4	Qualitative Description.....	3
2.2.3.5	Summary of Results	3
2.2.4	Time-Interval Increasing Spacing	3
2.2.4.1	Nature of Change That Leads to Highest Modelling Accuracy.....	3
2.2.4.2	Bias.....	3
2.2.4.3	Precision	3
2.2.4.4	Qualitative Description.....	3

2.2.4.5	Summary of Results	3
2.2.5	Time-Interval Decreasing Spacing	3
2.2.5.1	Nature of Change That Leads to Highest Modelling Accuracy	3
2.2.5.2	Bias.....	3
2.2.5.3	Precision	3
2.2.5.4	Qualitative Description.....	3
2.2.5.5	Summary of Results	3
2.2.6	Middle-and-Extreme Spacing	3
2.2.6.1	Nature of Change That Leads to Highest Modelling Accuracy	3
2.2.6.2	Bias.....	3
2.2.6.3	Precision	3
2.2.6.4	Qualitative Description.....	3
2.2.6.5	Summary of Results	3
2.2.7	Addressing My Research Questions.....	3
2.2.7.1	Does Placing Measurements Near Periods of Change In- crease Modelling Accuracy?	3
2.2.7.2	When the Nature of Change is Unknown, How Should Measurements be Spaced?	3
2.3	Summary of Experiment 1	3
3	Experiment 2.....	3
3.1	Methods	5
3.1.1	Variables Used in Simulation Experiment.....	5
3.1.1.1	Independent Variables	5
3.1.1.1.1	Spacing of Measurements	5
3.1.1.1.2	Number of Measurements.....	5
3.1.1.1.3	Sample Size.....	5
3.1.1.2	Constants	5
3.1.1.3	Dependent Variables.....	5
3.1.1.3.1	Convergence Success Rate	5
3.1.1.3.2	Bias	5
3.1.1.3.3	Precision.....	5
3.1.2	Overview of Data Generation.....	5
3.1.3	Modelling of Each Generated Data Set	5

3.1.4	Analysis of Data Modelling Output and Accompanying Visualizations	5
3.2	Results and Discussion.....	5
3.2.1	Framework for Interpreting Results.....	5
3.2.2	Pre-Processing of Data and Model Convergence	5
3.2.3	Equal Spacing.....	5
3.2.3.1	Bias.....	5
3.2.3.2	Precision	5
3.2.3.3	Qualitative Description.....	5
3.2.3.4	Summary of Results	5
3.2.4	Time-Interval Increasing Spacing	5
3.2.4.0.1	Bias	5
3.2.4.0.2	Precision	5
3.2.4.0.3	Qualitative Description	5
3.2.4.1	Summary of Results	5
3.2.5	Time-Interval Decreasing Spacing	5
3.2.5.1	Bias.....	5
3.2.5.2	Precision	5
3.2.5.3	Qualitative Description.....	5
3.2.5.4	Summary of Results	5
3.2.6	Middle-and-Extreme Spacing	5
3.2.6.0.1	Bias	5
3.2.6.0.2	Precision	5
3.2.6.0.3	Qualitative Description	5
3.2.6.1	Summary of Results	5
3.3	What Measurement Number-Sample Size Pairings Should be Used With Each Spacing Schedule?	5
4	Experiment 3.....	5
4.1	Methods	7
4.1.1	Variables Used in Simulation Experiment.....	7
4.1.1.1	Independent Variables	7
4.1.1.1.1	Number of Measurements.....	7
4.1.1.1.2	Sample Size.....	7
4.1.1.1.3	Time Structuredness	7

4.1.1.2	Constants	7
4.1.1.3	Dependent Variables	7
4.1.1.3.1	Convergence Success Rate	7
4.1.1.3.2	Bias	7
4.1.1.3.3	Precision	7
4.1.2	Overview of Data Generation	7
4.1.2.0.1	Simulation Procedure for Time Structuredness	7
4.1.3	Modelling of Each Generated Data Set	7
4.1.4	Analysis of Data Modelling Output and Accompanying Visualizations	7
4.2	Results and Discussion	7
4.2.1	Framework for Interpreting Results	7
4.2.2	Pre-Processing of Data and Model Convergence	7
4.2.3	Time-Structured Data	7
4.2.3.0.1	Bias	7
4.2.3.0.2	Precision	7
4.2.3.0.3	Qualitative Description	7
4.2.3.1	Summary of Results	7
4.2.4	Time-Unstructured Data Characterized by a Fast Response Rate	7
4.2.4.0.1	Bias	7
4.2.4.0.2	Precision	7
4.2.4.0.3	Qualitative Description	7
4.2.4.1	Summary of Results	7
4.2.5	Time-Unstructured Data Characterized by a Slow Response Rate	7
4.2.5.0.1	Bias	7
4.2.5.0.2	Precision	7
4.2.5.0.3	Qualitative Description	7
4.2.5.1	Summary of Results	7
4.2.6	How Does Time Structuredness Affect Modelling Accuracy?	7
4.2.7	Eliminating the Bias Caused by Time Unstructuredness: Using Definition Variables	7
4.3	Summary	7
5	References	8

LIST OF TABLES

DRAFT

LIST OF FIGURES

DRAFT

LIST OF APPENDICES

Appendix A: OpenMx Code for Structured Latent Growth Curve Model Used in Simulation Experiments	9
Appendix B: OpenMx Code for Structured Latent Growth Curve Model With Definition Variables.....	11

DRAFT

1 thesisdown::thesis_gitbook: default

Placeholder

1.1 The Need to Conduct Longitudinal Research

1.2 Understanding Patterns of Change That Emerge Over Time

1.3 Challenges Involved in Conducting Longitudinal Research

1.3.1 Number of Measurements

1.3.2 Spacing of Measurements

1.3.3 Time Structuredness

1.3.3.1 Time-Structured Data

1.3.3.2 Time-Unstructured Data

1.3.4 Summary

1.4 Using Simulations To Assess Modelling Accuracy

1.5 Systematic Review of Simulation Literature

1.5.1 Systematic Review Methodology

1.5.2 Systematic Review Results

1.5.3 Next Steps

1.6 Methods of Modelling Nonlinear Patterns of Change Over Time

1.7 Overview of Simulation Experiments

2 Experiment 1

Placeholder

DRAFT

2.1 Methods

2.1.1 Variables Used in Simulation Experiment

2.1.1.1 Independent Variables

2.1.1.1.1 Spacing of Measurements

2.1.1.1.2 Number of Measurements

2.1.1.1.3 Population Values Set for The Fixed-Effect Days-to-Halfway Elevation Parameter β_{fixed} (Nature of Change)

2.1.1.2 Constants

2.1.1.3 Dependent Variables

2.1.1.3.1 Convergence Success Rate

2.1.1.3.2 Bias

2.1.1.3.3 Precision

2.1.2 Overview of Data Generation

2.1.2.1 Data Generation

2.1.2.1.1 Function Used to Generate Each Data Set

2.1.2.1.2 Population Values Used for Function Parameters

2.1.3 Modelling of Each Generated Data Set

2.1.4 Analysis of Data Modelling Output and Accompanying Visualizations

2.1.4.1 Analysis of Convergence Success Rate

2.1.4.2 Analysis and Visualization of Bias

2.1.4.3 Analysis and Visualization of Precision

2.1.4.3.1 Effect Size Computation for Precision

2.2 Results and Discussion

2.2.1 Framework for Interpreting Results

2.2.2 Pre-Processing of Data and Model Convergence

DRAFT

79 3.1 Methods

80 3.1.1 Variables Used in Simulation Experiment

81 3.1.1.1 Independent Variables

82 3.1.1.1.1 Spacing of Measurements

83 3.1.1.1.2 Number of Measurements

84 3.1.1.1.3 Sample Size

85 3.1.1.2 Constants

86 3.1.1.3 Dependent Variables

87 3.1.1.3.1 Convergence Success Rate

88 3.1.1.3.2 Bias

89 3.1.1.3.3 Precision

90 3.1.2 Overview of Data Generation

91 3.1.3 Modelling of Each Generated Data Set

92 3.1.4 Analysis of Data Modelling Output and Accompanying Visualizations

93 3.2 Results and Discussion

94 3.2.1 Framework for Interpreting Results

95 3.2.2 Pre-Processing of Data and Model Convergence

96 3.2.3 Equal Spacing

97 3.2.3.1 Bias

98 3.2.3.2 Precision

99 3.2.3.3 Qualitative Description

100 3.2.3.4 Summary of Results

101 3.2.4 Time-Interval Increasing Spacing

102 3.2.4.0.1 Bias

103 3.2.4.0.2 Precision

DRAFT

120	4.1 Methods
121	4.1.1 Variables Used in Simulation Experiment
122	4.1.1.1 Independent Variables
123	4.1.1.1.1 Number of Measurements
124	4.1.1.1.2 Sample Size
125	4.1.1.1.3 Time Structuredness
126	4.1.1.2 Constants
127	4.1.1.3 Dependent Variables
128	4.1.1.3.1 Convergence Success Rate
129	4.1.1.3.2 Bias
130	4.1.1.3.3 Precision
131	4.1.2 Overview of Data Generation
132	4.1.2.0.1 Simulation Procedure for Time Structuredness
133	4.1.3 Modelling of Each Generated Data Set
134	4.1.4 Analysis of Data Modelling Output and Accompanying Visualizations
135	4.2 Results and Discussion
136	4.2.1 Framework for Interpreting Results
137	4.2.2 Pre-Processing of Data and Model Convergence
138	4.2.3 Time-Structured Data
139	4.2.3.0.1 Bias
140	4.2.3.0.2 Precision
141	4.2.3.0.3 Qualitative Description
142	4.2.3.1 Summary of Results
143	4.2.4 Time-Unstructured Data Characterized by a Fast Response Rate
144	4.2.4.0.1 Bias

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Appendix A: OpenMx Code for Structured Latent Growth Curve Model Used in Simulation Experiments

Code Block A.1

OpenMx Code for Structured Latent Growth Curve Model

```
1 #Manifest variable names (i.e., names of columns cotaining data points at each time
  point [e.g., ])
2 manifest_vars <- nonlinSims:::extract_manifest_var_names(data_wide = data_wide)
3
4 #Latent variable names (theta = baseline, alpha = maximal elevation, beta =
  days-to-halfway elevation, gamma = triquarter-halfway elevation)
5 latent_vars <- c('theta', 'alpha', 'beta', 'gamma')
6
7 #initial checks
8 tryCatch(expr = model_name, error = function(e) {message("Error: model_name is not a
  character vector")})
9
10 manifest_vars <- extract_manifest_var_names(data_wide = data_wide)
11 latent_vars <- c('theta', 'alpha', 'beta', 'gamma')
12 measurement_days <- measurement_days
13
14 model <- mxModel(model = model_name,
15                  type = 'RAM', independent = T,
16                  mxData(observed = data_wide, type = 'raw'),
17
18                  manifestVars = manifest_vars,
19                  latentVars = latent_vars,
20
21                  #Residual variances; by using one label, they are assumed to all be
  equal (homogeneity of variance)
22                  mxPath(from = manifest_vars,
23                          arrows=2, free=TRUE, labels='epsilon', values = 1, lbound =
  0),
24
25                  #Latent variable covariances and variances
26                  mxPath(from = latent_vars,
27                          connect='unique.pairs', arrows=2,
28                          #aa(diff_rand), ab(cov_diff_beta), ac(cov_diff_gamma),
  bb(beta_rand), bc(var_beta_gamma), cc(gamma_rand)
29                          free = c(TRUE,FALSE, FALSE, FALSE,
30                                  TRUE, FALSE, FALSE,
31                                  TRUE, FALSE,
32                                  TRUE),
33                          values=c(1, NA, NA, NA,
34                                  1, NA, NA,
35                                  1, NA,
36                                  1),
37                          labels=c('theta_rand', 'NA(cov_theta_alpha)',
38                                  'NA(cov_theta_beta)',
39                                  'NA(cov_theta_gamma)',
40                                  'alpha_rand', 'NA(cov_alpha_beta)',
41                                  'NA(cov_alpha_gamma)',
42                                  'beta_rand', 'NA(cov_beta_gamma)',
43                                  'gamma_rand'),
44                          lbound = c(1e-3, NA, NA, NA,
45                                  1e-3, NA, NA,
46                                  1, NA,
47                                  1),
48                          ubound = c(2, NA, NA, NA,
49                                  2, NA, NA,
50                                  90^2, NA,
```

```

49         45^2)),
50
51     #Latent variable means (linear parameters). Note that the nonlinear
52     parameters of beta and gamma do not have estimated means
53     mxPath(from = 'one', to = c('theta', 'alpha'), free = c(TRUE,
54     TRUE), arrows = 1,
55     labels = c('theta_fixed', 'alpha_fixed'), lbound = 0, ubound
56     = 7,
57     values = c(1, 1)),
58
59     #Functional constraints
60     mxMatrix(type = 'Full', nrow = length(manifest_vars), ncol = 1,
61     free = TRUE,
62     labels = 'theta_fixed', name = 't', values = 1, lbound =
63     0, ubound = 7),
64     mxMatrix(type = 'Full', nrow = length(manifest_vars), ncol = 1,
65     free = TRUE,
66     labels = 'alpha_fixed', name = 'a', values = 1, lbound =
67     0, ubound = 7),
68     mxMatrix(type = 'Full', nrow = length(manifest_vars), ncol = 1,
69     free = TRUE,
70     labels = 'beta_fixed', name = 'b', values = 1, lbound = 1,
71     ubound = 360),
72     mxMatrix(type = 'Full', nrow = length(manifest_vars), ncol = 1,
73     free = TRUE,
74     labels = 'gamma_fixed', name = 'g', values = 1, lbound =
75     1, ubound = 360),
76
77     mxMatrix(type = 'Full', nrow = length(manifest_vars), ncol = 1,
78     free = FALSE,
79     values = measurement_days, name = 'time'),
80
81     #Algebra specifying first partial derivatives;
82     mxAlgebra(expression = 1 - 1/(1 + exp((b - time)/g)), name="T1"),
83     mxAlgebra(expression = 1/(1 + exp((b - time)/g)), name = 'A1'),
84     mxAlgebra(expression = -((a - t) * (exp((b - time)/g) * (1/g))/(1 +
85     exp((b - time)/g))^2), name = 'B1'),
86     mxAlgebra(expression = (a - t) * (exp((b - time)/g) * ((b -
87     time)/g^2))/(1 + exp((b -time)/g))^2, name = 'G1'),
88
89     #Factor loadings; all fixed and, importantly, constrained to change
90     according to their partial derivatives (i.e., nonlinear functions)
91     mxPath(from = 'theta', to = manifest_vars, arrows=1, free=FALSE,
92     labels = sprintf(fmt = 'T1[%d,1]',
93     1:length(manifest_vars))),
94     mxPath(from = 'alpha', to = manifest_vars, arrows=1, free=FALSE,
95     labels = sprintf(fmt = 'A1[%d,1]',
96     1:length(manifest_vars))),
97     mxPath(from='beta', to = manifest_vars, arrows=1, free=FALSE,
98     labels = sprintf(fmt = 'B1[%d,1]',
99     1:length(manifest_vars))),
100    mxPath(from='gamma', to = manifest_vars, arrows=1, free=FALSE,
101    labels = sprintf(fmt = 'G1[%d,1]',
102    1:length(manifest_vars))),
103
104    mxFitFunctionML(vector = FALSE)
105
106    )
107
108    names(data.wide)[2:8]

```

```

160 [1] "obs_score_0"    "obs_score_60"   "obs_score_120"  "obs_score_180"

```

```

161 [5] "obs_score_240"  "obs_score_300"  "obs_score_360"

```

Appendix B: OpenMx Code for Structured Latent Growth

Curve Model With Definition Variables

Code Block ?? OpenMx Code for Structured Latent Growth Curve Model With
Definition Variables OpenMx Code for Structured Latent Growth Curve Model With
Definition Variables section on [Appendix B](#)

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