

# Contents

<b>List of Tables</b>	<b>xvii</b>
<b>List of Figures</b>	<b>xix</b>
<b>Preface</b>	<b>xxi</b>
<b>1 “The first time”</b>	<b>1</b>
1.1 Starting Stata . . . . .	1
1.2 Setting up your screen . . . . .	2
1.3 Your first analysis . . . . .	2
1.3.1 Inputting commands . . . . .	2
1.3.2 Files and the working memory . . . . .	3
1.3.3 Loading data . . . . .	3
1.3.4 Variables and observations . . . . .	5
1.3.5 Looking at data . . . . .	6
1.3.6 Interrupting a command and repeating a command . . . . .	8
1.3.7 The variable list . . . . .	8
1.3.8 The in qualifier . . . . .	8
1.3.9 Summary statistics . . . . .	9
1.3.10 The if qualifier . . . . .	11
1.3.11 Define missing values . . . . .	11
1.3.12 The by prefix . . . . .	12
1.3.13 Command options . . . . .	13
1.3.14 Frequency tables . . . . .	14
1.3.15 Variable labels and value labels . . . . .	15
1.3.16 Graphs . . . . .	16
1.3.17 Getting help . . . . .	16

1.3.18	Recoding of variables . . . . .	18
1.3.19	Linear regression . . . . .	19
1.4	Do-files . . . . .	19
1.5	Exiting Stata . . . . .	21
1.6	Exercises . . . . .	22
<b>2</b>	<b>Working with do-files</b>	<b>25</b>
2.1	From interactive work to working with a do-file . . . . .	25
2.1.1	Alternative 1 . . . . .	25
2.1.2	Alternative 2 . . . . .	27
2.2	Designing do-files . . . . .	30
2.2.1	Comments . . . . .	31
2.2.2	Line breaks . . . . .	32
2.2.3	Some crucial commands . . . . .	33
2.3	Organizing your work . . . . .	35
2.4	Exercises . . . . .	39
<b>3</b>	<b>The grammar of Stata</b>	<b>41</b>
3.1	The elements of Stata commands . . . . .	41
3.1.1	Stata commands . . . . .	41
3.1.2	The variable list . . . . .	43
List of variables: Required or optional . . . . .	43	
Abbreviation rules . . . . .	43	
Special listings . . . . .	45	
3.1.3	Options . . . . .	45
3.1.4	The in qualifier . . . . .	47
3.1.5	The if qualifier . . . . .	48
3.1.6	Expressions . . . . .	50
Operators . . . . .	51	
Functions . . . . .	52	
3.1.7	Lists of numbers . . . . .	53
3.1.8	Using filenames . . . . .	53

3.2	Repeating similar commands . . . . .	55
3.2.1	The by prefix . . . . .	55
3.2.2	The foreach loop . . . . .	57
	The types of foreach lists . . . . .	58
	Several commands within a foreach loop . . . . .	59
3.2.3	The forvalues loop . . . . .	60
3.3	Weights . . . . .	60
	Frequency weights . . . . .	61
	Analytic weights . . . . .	63
	Probability weights . . . . .	64
3.4	Exercises . . . . .	65
<b>4</b>	<b>General comments on the statistical commands</b>	<b>67</b>
4.1	Exercises . . . . .	70
<b>5</b>	<b>Creating and changing variables</b>	<b>73</b>
5.1	The commands generate and replace . . . . .	73
5.1.1	Variable names . . . . .	74
5.1.2	Some examples . . . . .	75
5.1.3	Changing codes with by, _n, and _N . . . . .	78
5.1.4	Subscripts . . . . .	82
5.2	Specialized recoding commands . . . . .	84
5.2.1	The recode command . . . . .	84
5.2.2	The egen command . . . . .	84
5.3	More tools for recoding data . . . . .	86
5.3.1	String functions . . . . .	86
5.3.2	Date and time functions . . . . .	90
	Dates . . . . .	91
	Time . . . . .	93
5.4	Commands for dealing with missing values . . . . .	96
5.5	Labels . . . . .	98

5.6	Storage types, or the ghost in the machine . . . . .	100
5.7	Exercises . . . . .	101
<b>6</b>	<b>Creating and changing graphs</b>	<b>103</b>
6.1	A primer on graph syntax . . . . .	103
6.2	Graph types . . . . .	104
6.2.1	Examples . . . . .	105
6.2.2	Specialized graphs . . . . .	107
6.3	Graph elements . . . . .	107
6.3.1	Appearance of data . . . . .	109
	Choice of marker . . . . .	111
	Marker colors . . . . .	112
	Marker size . . . . .	113
	Lines . . . . .	113
6.3.2	Graph and plot regions . . . . .	116
	Graph size . . . . .	117
	Plot region . . . . .	117
	Scaling the axes . . . . .	118
6.3.3	Information inside the plot region . . . . .	119
	Reference lines . . . . .	120
	Labeling inside the plot region . . . . .	120
6.3.4	Information outside the plot region . . . . .	124
	Labeling the axes . . . . .	124
	Tick lines . . . . .	127
	Axis titles . . . . .	128
	The legend . . . . .	129
	Graph titles . . . . .	130
6.4	Multiple graphs . . . . .	131
6.4.1	Overlaying many twoway graphs . . . . .	131
6.4.2	Option by() . . . . .	133
6.4.3	Combining graphs . . . . .	134

	Quantile plot . . . . .	175
	Comparing distributions with Q-Q plots . . . . .	178
7.4	Exercises . . . . .	179
<b>8</b>	<b>Introduction to linear regression</b>	<b>181</b>
8.1	Simple linear regression . . . . .	184
8.1.1	The basic principle . . . . .	184
8.1.2	Linear regression using Stata . . . . .	188
	The table of coefficients . . . . .	188
	Standard errors . . . . .	191
	The table of ANOVA results . . . . .	192
	The model fit table . . . . .	195
8.2	Multiple regression . . . . .	196
8.2.1	Multiple regression using Stata . . . . .	197
8.2.2	More computations . . . . .	199
	Adjusted $R^2$ . . . . .	199
	Standardized regression coefficients . . . . .	200
8.2.3	What does “under control” mean? . . . . .	201
8.3	Regression diagnostics . . . . .	203
8.3.1	Violation of $E(\epsilon_i) = 0$ . . . . .	204
	Linearity . . . . .	206
	Influential cases . . . . .	209
	Omitted variables . . . . .	218
	Multicollinearity . . . . .	218
8.3.2	Violation of $\text{Var}(\epsilon_i) = \sigma^2$ . . . . .	219
8.3.3	Violation of $\text{Cov}(\epsilon_i, \epsilon_j) = 0, i \neq j$ . . . . .	221
8.4	Model extensions . . . . .	222
8.4.1	Categorical independent variables . . . . .	222
8.4.2	Interaction terms . . . . .	225
8.4.3	Regression models using transformed variables . . . . .	228
	Nonlinear relations . . . . .	229

	Eliminating heteroskedasticity . . . . .	231
8.5	More on standard errors . . . . .	232
8.5.1	Bootstrap techniques . . . . .	232
8.5.2	Confidence intervals in cluster samples . . . . .	234
8.6	Advanced techniques . . . . .	236
8.6.1	Median regression . . . . .	236
8.6.2	Regression models for panel data . . . . .	237
	From wide to long format . . . . .	238
	Fixed-effects models . . . . .	242
8.6.3	Error-components models . . . . .	245
8.7	Exercises . . . . .	248
<b>9</b>	<b>Regression models for categorical dependent variables</b>	<b>249</b>
9.1	The linear probability model . . . . .	250
9.2	Basic concepts . . . . .	253
9.2.1	Odds, log odds, and odds ratios . . . . .	253
9.2.2	Excursion: The maximum likelihood principle . . . . .	258
9.3	Logistic regression with Stata . . . . .	261
9.3.1	The coefficient table . . . . .	263
	Sign interpretation . . . . .	264
	Interpretation with odds ratios . . . . .	264
	Probability interpretation . . . . .	265
9.3.2	The iteration block . . . . .	266
9.3.3	The model fit block . . . . .	267
	Classification tables . . . . .	268
	Pearson chi-squared . . . . .	271
9.4	Logistic regression diagnostics . . . . .	272
9.4.1	Linearity . . . . .	272
9.4.2	Influential cases . . . . .	276
9.5	Likelihood-ratio test . . . . .	279
9.6	Refined models . . . . .	281

9.6.1	Nonlinear relationships . . . . .	281
9.6.2	Categorical independent variables . . . . .	282
9.6.3	Interaction effects . . . . .	284
9.7	Advanced techniques . . . . .	285
9.7.1	Probit models . . . . .	285
9.7.2	Multinomial logistic regression . . . . .	288
9.7.3	Models for ordinal data . . . . .	292
9.8	Exercises . . . . .	294
<b>10</b>	<b>Reading and writing data</b>	<b>297</b>
10.1	The goal: the data matrix . . . . .	297
10.2	Importing machine-readable data . . . . .	298
10.2.1	Reading system files from other packages . . . . .	299
10.2.2	Reading ASCII text files . . . . .	300
	Reading data in spreadsheet format . . . . .	300
	Reading data in free format . . . . .	302
	Reading data in fixed format . . . . .	304
10.3	Inputting data . . . . .	307
10.3.1	Input data using the Data Editor . . . . .	307
10.3.2	The input command . . . . .	308
10.4	Combining data . . . . .	312
10.4.1	The GSOEP database . . . . .	312
10.4.2	The merge command . . . . .	314
	The merge procedure . . . . .	315
	Keeping track of observations . . . . .	317
	Merging more than two files . . . . .	318
	Merging data on different levels . . . . .	320
10.4.3	The append command . . . . .	323
10.5	Saving and exporting data . . . . .	326
10.6	Handling large datasets . . . . .	327
10.6.1	Rules for handling the working memory . . . . .	327

10.6.2	Using oversized datasets . . . . .	329
10.7	Exercises . . . . .	330
<b>11</b>	<b>Do-files for advanced users and user-written programs</b>	<b>333</b>
11.1	Two examples of usage . . . . .	333
11.2	Four programming tools . . . . .	335
11.2.1	Local macros . . . . .	335
	Calculating with local macros . . . . .	336
	Combining local macros . . . . .	337
	Changing local macros . . . . .	337
11.2.2	Do-files . . . . .	339
11.2.3	Programs . . . . .	339
	The problem of redefinition . . . . .	340
	The problem of naming . . . . .	341
	The problem of error checking . . . . .	341
11.2.4	Programs in do-files and ado-files . . . . .	342
11.3	User-written Stata commands . . . . .	345
11.3.1	Parsing variable lists . . . . .	348
11.3.2	Parsing options . . . . .	349
11.3.3	Parsing if and in qualifiers . . . . .	351
11.3.4	Generating an unknown number of variables . . . . .	352
11.3.5	Default values . . . . .	354
11.3.6	Extended macro functions . . . . .	356
11.3.7	Avoiding changes in the dataset . . . . .	358
11.3.8	Help files . . . . .	359
11.4	Exercises . . . . .	360
<b>12</b>	<b>Around Stata</b>	<b>363</b>
12.1	Resources and information . . . . .	363
12.2	Taking care of Stata . . . . .	364
12.3	Additional procedures . . . . .	366
12.3.1	SJ and STB ado-files . . . . .	366



12.3.2	SSC ado-files . . . . .	367
12.3.3	Other ado-files . . . . .	368
12.4	Exercises . . . . .	369
	<b>References</b>	<b>371</b>
	<b>Author index</b>	<b>377</b>
	<b>Subject index</b>	<b>379</b>