

# Subject index

## Symbols

`/* */` comments ..... 412  
`//` `NotReached` ..... 358  
`!!` (sic) ..... 357

## A

abort with error ..... 43–44  
    equivalent to C crashing ..... 416  
accuracy ..... 115–120, 131, *also see*  
    numerical accuracy  
`.ado` file ..... 12  
ado-files, writing Mata code for ... 145–  
    147, 373–399  
    accessing Stata's data .... 379–384,  
        393–394  
    changing Stata's dataset ..... 396  
    displaying results ..... 387–388  
    executing Stata commands ... 397–  
        399  
    handling errors ..... 384–386  
    modifying Stata's data ..... 394  
    obtaining all variable names ... 396  
    parsing ..... 375–378  
    placement of Mata function .. 145–  
        153, 373–374  
    private Mata function .... 145–153,  
        373–374  
    returning results ..... 389–393  
    Stata interface functions .. 393–399  
    structuring of code ..... 375  
    working with Stata macros, scalars,  
        matrices ..... 396–397  
    working with Stata's metadata ...  
        ..... 394–396  
    working with views ..... 393–394  
approved source directory .... 154–156,  
    218–219, 261

`args()` function ..... 125–127  
argument ..... *see* function argument  
arithmetic operators ..... 75–76  
ASD ..... *see* approved source directory  
`assert()` function ..... 136–137  
`assert` Stata command ..... 150–152  
assignment operator ..... 73–74  
associative array .... 281–284, 341–344,  
    348  
    `firstval()` ..... 343–344, 348  
    `key()` ..... 343–344, 348  
    `keys()` ..... 341–344, 348  
    `nextval()` ..... 343–344, 348

## B

boolean type ..... *see* macroed type,  
    boolean

## C

C and C++, difference from Mata ....  
    ..... 411–416  
`C()` function ..... 72, 104–105, 408  
certification file .....  
    .. 136–139, 141–144, 213–218,  
        260–261, 321, 360, 365–366  
    comparison with validation ... 144  
    for ado ..... 150–152  
class ..... 36–38, 112–113, 221–247,  
    249–261, 296–297, 312–320  
    `::` prefix to call external function  
        ..... 224–225, 233  
    calling external function .. 224–225  
    constructor function ..... 231–233  
    creation ..... 231–233  
    deletion ..... 231–233  
`destroy()` user-written function ..  
    ..... 231–233

- class, *continued*
- do not document (DND) member ..
    - ..... 309–311, 364
  - freeing of memory ..... 232–233
  - function shadowing ..... 224–225
  - inheritance ..... 227–231, 238–247
    - final member ..... 243–245
    - function shadowing ..... 229
    - polymorphism ..... 245–246
    - virtual function ..... 240–244
    - when to use... 238–240, 246–247
  - instance definition .. see structure,
    - instance definition
  - macroed type ..... 273–276
  - `new()` user-written function .. 231–
    - 233
  - no member variable ..... 236–238
  - pointer ..... 247
  - private and public members .. 225–
    - 226, 234–235
  - protected members ..... 228–229
  - `setup()` user-written function ....
    - ..... 230–231
  - `super` prefix ..... 230–231
  - `this` prefix ..... 233
- `class` eltype ..... 103–105
- `class ->` operator ..... 94–96
- `classname()` function ..... 296–297
- Code numeric type .. see macroed type,
  - Code
- code, self-threading .. see self-threading
  - code
- colon operators ..... 82–83
- `cols()` function ..... 25
- column-join operator ..... 26–29, 80–82
- `colvector` orgtype ..... 103–105
- comment, nested ..... 412
- complex eltype ..... 103–105, 401–409
- complex value .. 22, 71–72, 78, 401–409
- compound quote character ..... 72–73
- `conj()` function ..... 401–402, 405
- constant ..... 277–280
- constructor function ..... see class, see
  - structure, see `J()` function
- `cross()` function .... 202–204, 209–211
- `crossdev()` function ..... 209–211
- D**
- decrement operator ..... 76–77
- derived type ..... see macroed type
- design document
  - formula sheet ..... 192–193, 207
  - notes ..... 308–309
  - shortcomings ..... 311–312
  - summary ..... 309–311
- development process ..... 285–321,
  - 324–367
- idea ..... 338–340
- DND ..... see class, do not document
  - (DND) member
- do-file
  - containing Mata code ..... 134–144
  - for scientific research ..... 314
- double-bang comment ..... 357
- E**
- element types ..... see variable type
- eltype ..... 103–105
- `eltype()` function ... 296–297, 408–409
- `_error()` function ..... 43–44
- expr* ..... see expression
- expression ..... 47–49, 62–97, see also
  - constant
  - assignment ..... 73–74
- E notation ..... 64–65
- literal ..... 64–71
  - base 10 ..... 64–65, 71
  - base 2 ..... 66–71, 217
  - complex ..... 71–72, 403–404
  - missing value ..... 65
  - missing values with complex ...
    - ..... 404
  - numeric ..... 64–71, 217
  - string ..... 72–73
- operator precedence ..... 74–75
- operators ..... 18–21
  - (void) cast ..... 97
  - = assignment ..... 18–21, 73–74
  - negation ..... 75–76

expression operators, *continued*

- + addition ..... 75–76
- subtraction ..... 75–76
- \* multiplication ..... 75–76
- / division ..... 75–76
- ^ power ..... 75–76
- ++ increment ..... 76–77
- decrement ..... 76–77
- == equality ..... 77–79, 167
- != inequality ..... 77–79, 167
- < less than ..... 77–79
- <= less than or equal to... 77–79
- > greater than ..... 77–79
- >= greater than or equal to.. 77–79
- & logical and ..... 77–79
- | logical or ..... 77–79
- ! logical negation ..... 77–79
- ? : conditional (ternary) ... 79–80
- [ ] element-and-list subscripts ..  
..... 83–92
- [ | ] range (submatrix)  
subscripts ..... 83–84, 92–93
- ' matrix transpose... 75–76, 405
- \ row join ..... 26–29, 80–81
- , column join ..... 26–29, 80–82
- :+ elementwise addition .. 82–83
- :- elementwise subtraction.. 82–83
- :\* elementwise multiplication ..  
..... 82–83
- :/ elementwise division... 82–83
- ^ elementwise power..... 82–83
- := elementwise equality.. 82–83
- != elementwise inequality.. 82–83
- <: elementwise less than.. 82–83
- <=: elementwise less than or  
equal to..... 82–83
- >: elementwise greater than....  
..... 82–83
- >=: elementwise greater than or  
equal to..... 82–83

expression operators, *continued*

- :& elementwise logical and .. 82–83
- :| elementwise logical or.. 82–83
- .. row count vector ..... 80, 82
- :: column count vector .. 80, 82
- & address (pointer) of .... 38–40,  
94–96, 172–175
- \* pointer dereference..... 38–40,  
94–96, 172–175
- > structure dereference .. 94–96
- > class dereference..... 94–96

**F**

- factorial() function ..... 130
- Filehandle type ..... see macroed type,  
Filehandle
- final member ..... see class, inheritance
- formula sheet ..... 192–193, 207, 254
- Fortran..... 47, 56, 58
- free() C and C++ function ..... 415
- function
  - argument ..... 81–82, 121–128, 412
  - difference in treatment between  
Mata C and C++ ..... 412
  - output ..... 110, 123–125
  - overloaded ... 109–110, 127–128,  
296–297, 315–318
  - passthru ..... 111–112, 170–172
  - varying number ..... 125–128
  - arguments* ..... 46
  - body*..... 47
  - break statement ..... 57
  - continue statement..... 57
  - do statement ..... 50
  - do while statement..... 50, 56–57
  - expression ..... see expression
  - for statement ..... 53–56
  - function statement..... 100–101
  - goto statement ..... 58
  - if statement ..... 49–50
  - looping construct..... see  
function, do while statement,  
see function, do statement, see  
function, while statement

function, *continued*  
*program body*.....46  
**return** statement.....59–60  
*returnedtype*.....46  
 returning **void**.....107–109  
 structure of.....46  
 syntax.....127–128  
 virtual.....see class, inheritance  
**while** statement.....50–53

**H**

hello, world.....9

**I**

**I()** function.....25  
**if** statement.....see function, **if**  
 statement  
**Im()** function.....401–402, 408  
 increment operator.....76–77  
 inheritance.....see class, inheritance  
 initialization of variables, default ..105  
 instance, definition.....165  
 integer value.....130–133  
 interactive mode.....40–42  
**invorder()** function.....88–91  
**invsym()** function.....40–42, 259  
**issymmetric()** function.....406

**J**

**J()** function.....26

**K**

key.....see associative array

**L**

**length()** function.....25  
 library.....see Mata library  
 linear-regression example.....177–219,  
 249–261  
 list subscript.....83–92  
**lmbuild** command.....14–16  
**lnfactorial()** function.....130  
 logical operators.....77–79  
**lr\***() function.....187–211  
**luinv()** function.....401–402

**M**

macroed type.....263–276  
 boolean.....268–269  
 Code.....269–271  
 Filehandle.....271  
 for classes.....273–276  
 for structures.....272–276  
 idiosyncratic.....272  
 Ocode.....271  
 Ordinal.....271  
**malloc()** C and C++ function...413–  
 414

## Mata

comparison with C and C++ pro-  
 gramming languages.....2–3  
 description.....2  
 difference from C and C++..411–  
 416  
 library.....14–16  
 building..153–159, 218–219, 261  
 .mata file...10, 137–141, 153–154, 158  
*Mata Reference Manual*.....1  
**matasstrict**.....115–120, 149, 167–168  
**matrix** orgtype.....103–105  
 matrix, view.....85  
**mean()** function.....209–211  
 member function.....see class  
 member variable.....see class, see  
 structure  
 missing value.....65  
 .mlib file.....14–16, *also see* Mata  
 library  
 erasing.....159  
**mreldif()** function.....258–259, 366

**N**

name conflict...236–237, 273–276, 313  
**n\_choose\_k()** function.....130–133  
 example.....129–159  
 packaged as ado-file.....145–153  
 packaged as do-file.....134–144  
 packaged as Mata library routine..  
 .....153–159  
 not-reached comment.....358  
**NotReached**.....358

null vector and matrix.....29–31  
**numeric** eltype ..... 103–105, 406–408  
 numerical accuracy.....  
     .....66–71, 130–133, 205–206,  
     211–212, 256–259, 365–366  
   matrix balancing.....259

**O**

operators ..... see expression operators  
**order()** function.....88–91  
 Ordinal numeric code type..... see  
   macroed type, Ordinal  
 organizational types.. see variable type  
**orgtype**..... 103–105  
 overloaded function ..... see function  
   argument, overloaded

**P**

**passthru** variable .... 111–112, 170–172  
 permutation matrix ..... 91–92  
 permutation vector.....88–92  
**pointer** eltype.....103–105  
 pointers ..... 38–40, 112–113, 247,  
   344–348, 417  
   advanced use ..... 344–348, 417  
   arithmetic is not allowed ..... 416  
   conserving memory ..... 174–175,  
   186–187  
   declaration ..... 112–113  
   differences from C and C++..413–  
   416  
   element of vector or matrix ... 415  
   to create 3-dimensional arrays....  
     ..... 417  
   to function ..... 94–96  
   value .....94–96, 172–175  
 polymorphism.... see class, inheritance  
 pragma ..... 115–120  
 program ..... see function  
 programmer, serious ..... 1–2  
 programming, semicolon line end char-  
   acter .....411–412  
 project to-do list ..... see double-bang  
   comment

**Q**

**quadcross()** function....205, 209–211  
**quadcrossdev()** function ..... 209–211  
 quote character.....72–73

**R**

range subscript.....83–84, 92–93  
**rcof** Stata command ..... 150–152  
**Re()** function ..... 401–402, 408  
**real** eltype.....103–105, 406–408  
 real value.....22, 64–71  
   closest to zero.....22  
   missing values.....22  
   range ..... 22  
   range of precise integer... 131, 133  
   range of precise integers.....22  
**round()** function ..... 130–131  
 row-join operator.....26–29, 80–81  
**rows()** function ..... 25  
**rowvector** orgtype.....103–105

**S**

**scalar** orgtype ..... 103–105  
 self-threading code...181–187, 252–253  
 semicolon, use to indicate end of line..  
     .....411–412  
**set matastrict**..... see **metastrict**  
**set rmsg**..... 325–330, 360  
**sort()** function ..... 88–91  
 sorting data matrices.....88–91  
 source directory ... see approved source  
   directory  
 sparse-matrix example.....285–321,  
   324–367  
   use with views..... 382–383  
 Stata.. see ado-files, writing Mata code  
   for  
 storage type..... see variable type  
 strict setting ..... see **metastrict**  
**string** eltype.....103–105  
 string value ..... 22, 24, 72–73, 78–79  
 string, differences from C and C++ ...  
     .....412–413  
**struct**..... see structure  
**struct** eltype.....103–105

structure . . . . . 34–36, 112–113, 161–175,  
177–219

- \* operator . . . . . 172–175
- & operator . . . . . 172–175
- accessing member . . . . . 162
- adding member variable . . . . . 166
- assignment . . . . . 167
- common error . . . . . 167–168
- constructor function . . . . . 168–170
- containing other structure . . . . . 166
- defining . . . . . 164
- instance definition . . . . . 165
- macroed type . . . . . 272–276
- pointer . . . . . 172–175
- returning . . . . . 163–164
- scalar . . . . . 167–168
- subscripting . . . . . 170
- testing equality . . . . . 167
- use of transmorphic . . . . . 170–172
- vector and matrix . . . . . 168–170

structure -> operator . . . . . 94–96

submatrix subscript . . . . . 83–84, 92–93

subscript . . . . . 83–93

**switch** and **case C** functions . . . . . 416

symmetric matrix . . . . . 256–259

- how to code . . . . . 258–259

## T

ternary conditional operator . . . . . 79–80

**test\_\*.do** file . . . . . 137–139, 141–144,  
158–159

**timer()** function . . . . . 330–338

timing code

- detailed . . . . . 330–338
- overall . . . . . 325–330, 360

to-do list for project . . see double-bang  
comment

tolerance . . . . . 66–71, 217

traceback log . . . . . 42–44, 106

transmorphic . . . . . 109–112, 170–172

- use with classes . . . . . 296–297

**transmorphic** eltype . . . . . 103–105

**\_transpose()** function . . . . . 300–301

**trunc()** function . . . . . 133

type . . . . . see variable type

## U

uninitialized

- value table . . . . . 105
- variable . . . . . 105

## V

validation . . . . . 144

variable

- initialization, default . . . . . 105
- instance, definition . . . . . 165
- passthru . . . . . 111–112, 170–172
- type . . 32–34, 99–113, 401–409, see  
also eltype, see also macroed  
type, see also orgtype
- complex . . . . . 401–409
- omitted . . . . . 100–101
- partial . . . . . 106–107
- real . . . . . 22
- string . . . . . 22–24

**vector** orgtype . . . . . 103–105

vector, permutation . . see permutation  
vector

**version** statement and number . . 11–13

view matrices . . . . . see matrix, view

virtual function . . see class, inheritance

void and void casting . . . . . 97, 107–109

## X

X notation . . . . . 66–71, 217