

Matlab Crash Course

[Empirical Finance and Financial Econometrics]

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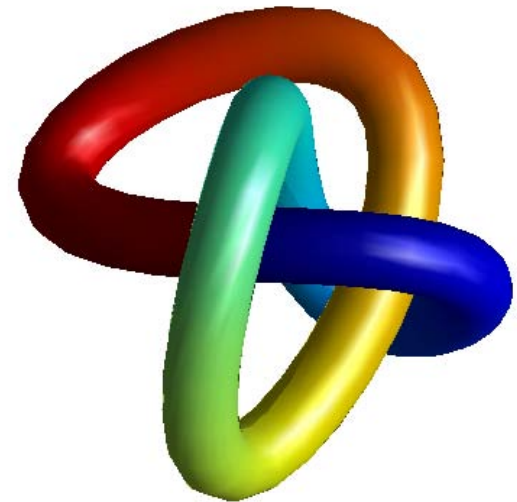
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Course and Class Structure

Basics

1st Lecture

Intro to Matlab and its Environment

1. Variables Definition
2. Matrix Access

2nd Lecture

Intro to Matlab and its Environment

1. Matrix Access (exerc.)
2. Single Matrix Manipulation (exerc.)
3. Multiple Matrix Manipulation (exerc.)

3rd Lecture

Intro to Programming

Applications

4th Lecture

Applications



Matrix Access

Single Values

As r,c index $\text{scalar}rc = M(r,c)$
As linear index $\text{linear} = M(n)$
(recall: `sub2ind` and `ind2sub`)

Rows and Columns

$\text{row} = M(r,:)$
 $\text{column} = M(:,c)$
 $\text{rows} = M(r:r+n,:)$
 $\text{columns} = M(:,c:c+n)$
 $\text{rowsandcolumns} = M(r:r+n,c:c+n)$

Diagonal(s)

$\text{MainDiagonal} = \text{diag}(M, \text{ind})$
 $\text{LowerTriangular} = \text{tril}(M, \text{ind})$
 $\text{UpperTriangular} = \text{triu}(M, \text{ind})$

Specific Values

Linear index

$\left\{ \begin{array}{l} \text{find}(M > 0.5) \\ \text{find}(M > 0.8 \ \& \ M < 1) \end{array} \right. \rightarrow M(\text{find}(M > 0.5)) = 1$

Logic index

$\left\{ \begin{array}{l} M > 0.5 \\ A = \text{randi}([0 \ 1], 5) \end{array} \right. \rightarrow M(M > 0.5) = 1$
 $\rightarrow M(\text{logical}(A)) = 1$

Logical Operators

$\&$	"and"	$<$	"strictly less"
$ $	"or"	$>$	"strictly bigger"
$==$	"equal"	\leq	"smaller or equal"
\sim	"different"	\geq	"bigger or equal"



Problems Set I



Single Matrix Manipulation



Add scalar $M(r+n,c+n)=s$



Add/delete row/column

Add row $M=[M; rv]$

Add column $M=[M cv]$

deleteRow $M[r:r+n,:]=[]$

deleteCol $M[:,c:c+n]=[]$



Add matrices

Mhoriz= $[M1; M2]$

Mvert= $[M1 M2]$

Mblock=blkdiag(M1,M2)



Some useful functions...

$M=\text{repmat}(X,r,c)$

$M=\text{reshape}(X,r,c)$

$M=\text{sort}(X,\text{dim},\text{'ascend'})$

$M=\text{sortrows}(X,c)$

$M=\text{fliplr}(X)$ $M=\text{flipud}(X)$

$M=\text{rot90}(X)$

$M=\text{kron}(X1,X2)$

$R=\text{rank}(X)$

$T=\text{trace}(X)$

$D=\text{det}(X)$

$I=\text{inv}(X)$

$[L U]=\text{lu}(X)$



Problems Set II



Multiple Matrices Operations

Algebraic Operations (+, -, *, /, \, ^, ')

$A+B$ | $A-B$ | $A*B$ | $A.*B$ | $A./B$ | $A.\backslash B$ | A^B | $A.^B$ | A'

Scalars $\left[\begin{array}{l} s=s1+s2 \ ; \ s=s1-s2 \\ s=s1*s2 \ ; \\ s=s1/s2 \ ; \\ s=s1\backslash s2 \ ; \\ s= s1^s2 \ ; \\ s=s' \end{array} \right.$

Vectors $\left[\begin{array}{l} v=v1+v2 \ ; \ v=v1-v2 \\ v=v1*v2 \ ; \ v=v1.*v2 \\ v=v1./v2 \ ; \ v=v1.\backslash v2 \\ v=v1^v2 \ ; \ v=v1.^v2 \end{array} \right.$

Matrices $\left[\begin{array}{l} M=M1+M2 \ ; \ M=M1-M2 \\ M=M1*M2 \ ; \ M=M1.*M2 \\ M=M1./M2 \ M=M1.\backslash M2 \\ M=M1^s \ ; \ M=M1.^M2 \end{array} \right.$



You can combine scalars, vectors and matrices. But you should be aware of some basic linear algebra rules (i.e. you can not sum vectors of different sizes, you can not premultiply a column vector with a matrix)



Some operations are not defined in linear algebra (i.e. $v1.*v2$)



Problems Set III