Assignment Project Exam Help

Application of Matlab for Finance

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September 4, 201

Today's Class

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-
- https://eduassistpro.github.i
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- Indexing and Colon Operator
- Examples

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What is Matlab?

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- A tool for econometrics and finance
- A tool for numerical methods, probability, and s
- A tool to produce graphics and plots

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Outline of Course

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- Lecture 1: Variables, Matrices, Indexing and Operations
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- Lecture 5: Trading Strategy
- Lecture 6: Simulation and Option Pricing
- Lecture 7: Regression Analysis
- Lecture 8: Revision
- Lecture 9: In-class Test

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Teaching materials

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- Course materials are available on the HUB and consist of

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- Each class consists of interactive sessions: a mix of the course leader demonstrating and the class students implem

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- Examination:
  - Coursework/Assignment (50%) - **comment on your code-file**
  - Individual Coursework / In class test in Lecture 9 (50%)

Administrative Details

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- Class Materials

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.school/
ass1 for

today (...//Class2 for next week etc)

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- MATLAB Download for personal PC:
http://www.imperial.ac.uk/admin-ser
resources/resources-and-services/more-free-software-students/

MATLAB Layout

- Command Window
  - Type commands and display non-graphic output
  - A >> prompt shows the system is ready for input
- Current Directory (CD)

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created: if you name your folder as 'Class1' with

```
cd('H:/MyMATLAB/Class_1')
```

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- Editor
  - The window where you edit and save m-files
  - m-files: the files that save scripts and functions that you've defined/created
- Workspace:
  - Store all the variables that you currently created and defined

Help File

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- Search Field: right up corner: "Search Documentation"

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- Command window: `help` followed by the name of the function
  - `help skewness`: on-screen text with us

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- In script help: highlight the function name and pre

Editor and Comments

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- 'New' → 'Script': create a standard .m-file
- Save the .m file as 'MyClass1.m', and do the following:
  - Change the current dictionary to the folder you created in H: drive.
    `n).`

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    - %%: split m-file into subsections
  - Execute your code (commands).
    - Type/copy your command in the comm
    - Execution by selection: F9
    - Execution by blocks: F5
  - Put a semi-colon ; behind `B = ones(100,1)` and comment
    - End a command with a semi-colon (;) to suppress the output.
    - Semi-colon (;) helps separate multiple commands that in one line

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Script vs. Live Script

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- With a standard script .m file, the codes are executed in the
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  -
  - No longer need the command window with ve
  - But cannot be used to create function (Class2 f

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- Repeat the previous exercise with a live Script 'MyClass1.mlx'.

Variables

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- A variable stores the assigned value in memory so that your programs can read it, operate on it, and save it back to memory.
- Variable names:

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- All MATLAB variables are stored and used as matrices.
  - Elements: numbers, characters, logical sta
  - Scalar (1-by-1): $A = 3$
  - Vector (1-by-n) or (n-by-1): $B = [1 \quad 2]$ $C =$ 2
  - Matrix (m-by-n) $D = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ for a 2-by-2 matrix

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Create Variables

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- Create
  $A = 3,\ B = [1\ 2],\ C = \begin{bmatrix}1\\2\end{bmatrix},\ D = \begin{bmatrix}1 & 2\\3 & 4\end{bmatrix},\ E = [0\ 0\ 0],\ F = \begin{bmatrix}1 & 3 & 5 & 7\\0 & 0.5 & 1 & 1.5\end{bmatrix}$
-
-
-
-

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- A matrix has multiple rows, separate the rows with semi-c

```
C = [1;2]
D = [1,2;3,4] %or D = [1,2;3,4]
```

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- Functions: `ones`, `zeros`, `rand`, `eyes`

```
E = zeros(1,3)
```

- Colon (:) to create a sequence of number: [start number:step size:end number]

```
F = [1:2:7;0:0.5:1.5]
```

Matrix Indexing and the Colon Operator

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- To reference a particular element in a matrix/variable, specify its row and column number within the matrix with a parentheses: **A(row, column)**
  - A(2,3) refers to the 2nd row, 3rd column element.
  -

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  - Colon (:) also selects a particular range of values in a matrix
    - $A(2, 1:3)$ selects the 1st, 2nd and 3rd eleme
    - $A(1:2, 3:4)$ selects elements in the 1st an columns of A, which answer is a 2-by-2 matrix.

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  - A middle number specifies the step size
    - $A(1, 1:2:5)$ selects the 1st, 3rd and 5th elements of the 1st row of matrix A.

Matrix Indexing and the Colon Operator

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- Find $A(2,3)$, $A(2,1:3)$, $A(1:2,3:4)$ and $A(1,1:2:5)$

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Matrix Indexing and the Colon Operator

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$$A = \begin{matrix} 1 & 2 & 3 & 4 & 5 \end{matrix}$$

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- $(\ ,\ :\ ) = [\ ,\ ,\ ]$
- $A(1:2, 3:4) = \begin{bmatrix} 3 & 4 \\ 8 & 9 \end{bmatrix}$

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- $A(1, 1:2:5) = [1, 3, 5]$

Matrix Indexing and Colon Operator: Define Variables

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- Define X = [1 2] with matrix indexing and then redefine X = [1 15]

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```
            0   0   0   0   0
Y(1,:)= 1:1:5
Y(2,:)= 0
% Way 2: use functions
Y1 = 1:1:5
Y2 = zeros(1,5)
Y = [Y1;Y2]
% Way 3
Y = [1:1:5;zeros(1,5)]
```

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Simple Matrix Operations

- Matrix Multiplication $A*B$ requires inner matrix dimensions agree: column number of A = row number of B
- Matrix Power A^b requires matrix A is a square matrix

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$A * B$	Multi
A / B	Divisio
A^b	Power (to
A'	Transpose
()	evaluation order

Element-by-Element Operations

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- MATLAB supports element-by-element arithmetic operations between matrices.
- The period character (.) distinguishes these operations from the linear algebra

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$A.*B$	Element-by-elem
$A./B$	Element-by-el
$A.^B$	Element-by-element Power

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$$a = [1 \quad 2 \quad 3 \quad 4] \qquad b = \begin{bmatrix} 4 \\ -3 \\ 2 \\ 4 \end{bmatrix} \qquad c = \begin{bmatrix} 2 & 3 \\ 1 & 4 \end{bmatrix}$$

- $a * b = 1*4 + 2*(-3) + 3*2 + 4*4 = 20$
  $(1\times 4) \quad (4\times 1) \qquad (1\times 1)$
  $4 \qquad 4*1 \quad 4*2 \quad 4*3 \quad 4*4$
-
$$= \begin{vmatrix} 2 & 4 & 6 & 8 \\ 4 & 8 & 12 & 16 \end{vmatrix}$$
- $b' = [4 \quad -3 \quad 2 \quad 4]$
- $a * b' : (1\times 4) * (1 \times 4)$: error message as 4 /
- $a.* b' = [1 \quad 2 \quad 3 \quad 4].*[4 \quad -3 \quad 2 \quad 4] = [1*4, \quad 2*-3, \quad 3*2, \quad 4*4] = [4, \quad -6, \quad 6, \quad 16]$
- $c^2 = \begin{bmatrix} 2 & 3 \\ 1 & 4 \end{bmatrix} * \begin{bmatrix} 2 & 3 \\ 1 & 4 \end{bmatrix} = \begin{bmatrix} 7 & 18 \\ 6 & 19 \end{bmatrix}$
- $c.^2 = \begin{bmatrix} 2^2 & 3^2 \\ 1^2 & 4^2 \end{bmatrix} = \begin{bmatrix} 4 & 9 \\ 1 & 16 \end{bmatrix}$

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Exercises

- (1) Create $a = [1 \quad 2 \quad 3 \quad 4]$ $b = \begin{bmatrix} 4 \\ -3 \\ 2 \\ 4 \end{bmatrix}$ $c = \begin{bmatrix} 2 & 3 \\ 1 & 4 \end{bmatrix}$.
- (2) Calculate and create
  - X4 $= c^2$
  - Try $a * b'$ (What the message says, why?
- (3) Element-by-element operation: $a.*b$
- (4) Using the colon(:) operator, create a 1-by-25 row vect
  - Var1 contains the integers 1 to 25.
  - Var2 contains the first element 0 and the last element 12, with a step size of 0.5.
- (5) Use the Help Field to find out what the commands `clear a`, `clear all` do.

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Predefined Functions

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- f
- `qs(.)`,
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`A`. Also use `area(.)` to have a different type of graph.

- The best way to find a particular function along with its usa
the MATLAB help file

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Exercises 2

- (6) Using the functions `zeros(.)`, `ones(.)` and `eye(.)` to create
  - a 3-by-4 matrix B full of ones
  - a 4-by-4 matrix C full of 5
  - a 5-by-5 identity matrix I

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5 5 5 1

- (7) Find the size and length of matrix B above
  - `size(.)` returns the dimension size of a ma number)
  - Adding an dimension indicator as the second input:
    - `size(B,1)` returns the number of rows of matrix B=3
    - `size(B,2)` returns the number of columns of matrix B = 4
  - `length(.)` returns the maximum dimension between the row number and col number of a matrix .

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Exercises 2

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- (8) Find the value of `sin(pi/2), cos(pi) exp(2) abs(-5)` and `sqrt(122)`
-

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  - `prod(A), prod(A,2), cumprod`
- (10) Create B equals to the second row of A, and make graphs
  - line plot `plot(.)`
  - area figure `area(.)`
  - bar figure `bar(.)`

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