



MATLAB for Finance

1 Getting Started



MATLAB

- ✱ **MAT**rix **LAB**oratory is a high-performance language for technical computing. It integrates computation, visualization, and programming in an easy-to-use environment where problems and solutions are expressed in familiar mathematical notation
 1. Programming language (similar to Fortran, C, etc.)
 2. Interactive environment with powerful graphic capacities
 3. Command line (textual) interface (standard I/O)
- ✱ Computation libraries (*Numerical Recipes*)
- ✱ Portability (Multiplatform: Windows, Solaris, HP-UX, IRIX, IRIX64, AIX, Digital UNIX, e LINUX)



Documentation

- ✚ MATLAB provides extensive documentation, in both printed and online format, to help you learn about and use all of its features

✚ Printed

- ✚ *Matlab, Reference Guide*, MathWorks
- ✚ *Matlab, User's Guide*, MathWorks
- ✚ *Matlab, Building a Graphical User Interface*, MathWorks

✚ On-Line

- ✚ info
- ✚ intro
- ✚ help [help]
- ✚ lookfor [-all]
- ✚ demo [MATLAB [...]]
- ✚ www.mathworks.com



References

- ✿ *MATLAB. The Language of Technical Computing*, Using MATLAB, ver. 5, The MathWorks Inc.
- ✿ Brandimarte P. (2002), Numerical methods in finance : a MATLAB-based introduction, Wiley, ISBN: 0-471-39686-9.
- ✿ Cherubini U., Della Lunga G. (2002) "Matematica Finanziaria. Applicazioni con Visual Basic per Excel", McGraw-Hill.
- ✿ Simon Benninga (2001) "Modelli finanziari. La finanza con Excel", McGraw-Hill.
- ✿ John C. Hull, "Opzioni, futures e altri derivati", Pearson-Prentice Hall, 6a ed. it., 2006, ISBN: 88-7192-288-3.
- ✿ Paul Wilmott (2003) "Introduzione alla Finanza quantitativa", Egea.
- ✿ Pascucci A. (2008) "Calcolo stocastico per la finanza", Springer.
- ✿ George Levy (2004) "Computational Finance", Quantitative Finance series, Elsevier.
- ✿ William Sharpe, *Macro-Investment Analysis*:
<http://www.stanford.edu/~wfsharpe/mia/mia.htm>



Aim of the course

- Source: Joerg Kienitz, Daniel Wetterau *Financial Modelling Theory, Implementation and Practice (with MATLAB Source)*, 2012

This book assumes some knowledge of finance and we do not aim to discuss the whole theory in this book. Thus, for instance, we do not cover in detail such important techniques as change of numeraire, arbitrage or the fundamental theorem of option pricing. We assume that the reader knows what options and financial instruments are and wishes to apply numerical techniques to such problems and, in doing so, to gain some practical understanding of the mathematics involved. We also assume that the reader has a working knowledge of Matlab. In particular, you should be familiar with the following topics:

- *Handling matrices and vectors.*
- *Fundamental Matlab syntax.*
- *Functions and function handles.*



Magic Square



Albrecht Dürer

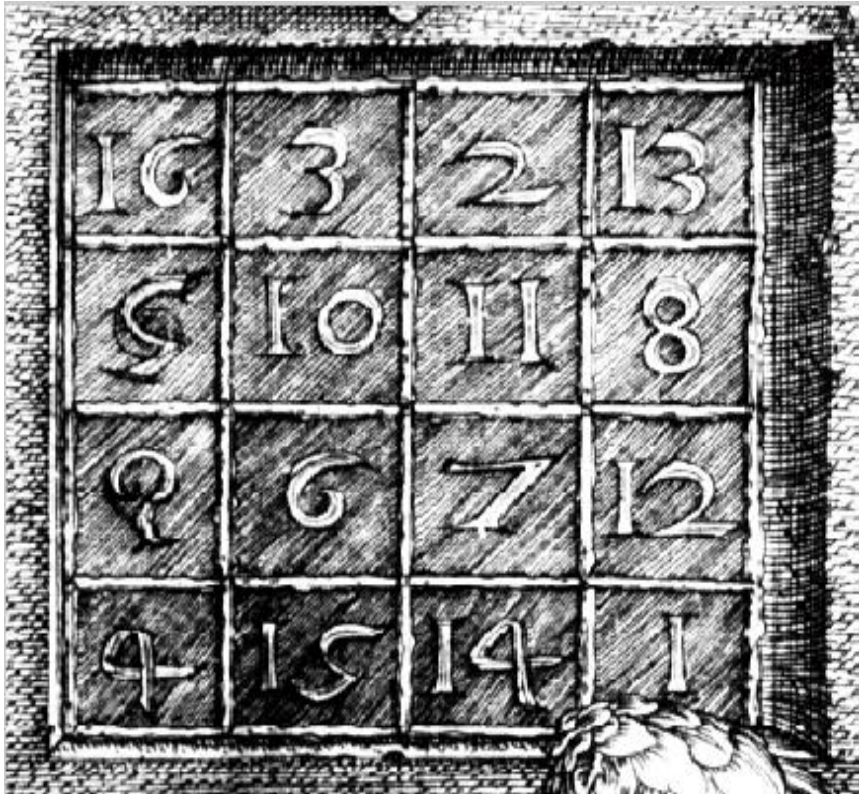
German artist and amateur mathematician author of Renaissance engraving *Melancholia I*

this is a matrix



01/03/2017

The Magic Square Properties: sum, transpose, diagonal



```
>>A = [16 3 2 13; 5 10 11 8  
       9 6 7 12; 4 15 14 1]
```

```
>>sum(A)
```

```
>>sum(A')
```

```
>>sum(A')'
```

```
>>sum(diag(A))
```

```
>>sum(diag(fliplr(A)))
```



Constants

- Decimal notation, decimal separator (dot), plus and minus signs, scientific notation and imaginary numbers

```
3 -99 0.0001 9.6397 1.6e-20 1i -3.1415j 3e5i
```

- System "Constants"

```
pi (3.141592...)      i ( $\sqrt{-1}$ )      j ( $\sqrt{-1}$ )  
eps (2-52) realmin (2-1022) realmax ((2-eps)21023)  
Inf (infinity)       NaN (not-a-number)
```

- Overwriting constants and resume

```
eps = 1.e-6  
clear eps
```




Punctuation

| | |
|------------------------------|-----|
| ⊗ Apostrophe or single quote | ' |
| ⊗ Brackets: | |
| ⊗ Parentheses | () |
| ⊗ Square brackets | [] |
| ⊗ Curly brackets | { } |
| ⊗ Angle brackets or Chevrons | < > |
| ⊗ Colon | : |
| ⊗ Semi-colon | ; |
| ⊗ Comma | , |
| ⊗ Dash | - |
| ⊗ Slash | / |
| ⊗ Back-slash | \ |



Punctuation

| | |
|-------------------|---|
| ⊕ Ampersand | & |
| ⊕ Asterisk | * |
| ⊕ At | @ |
| ⊕ Caret | ^ |
| ⊕ Tilde (Alt+126) | ~ |
| ⊕ Underscore | _ |
| ⊕ Vertical bar | |