Introduction to MATLAB for Finance

Bratislava
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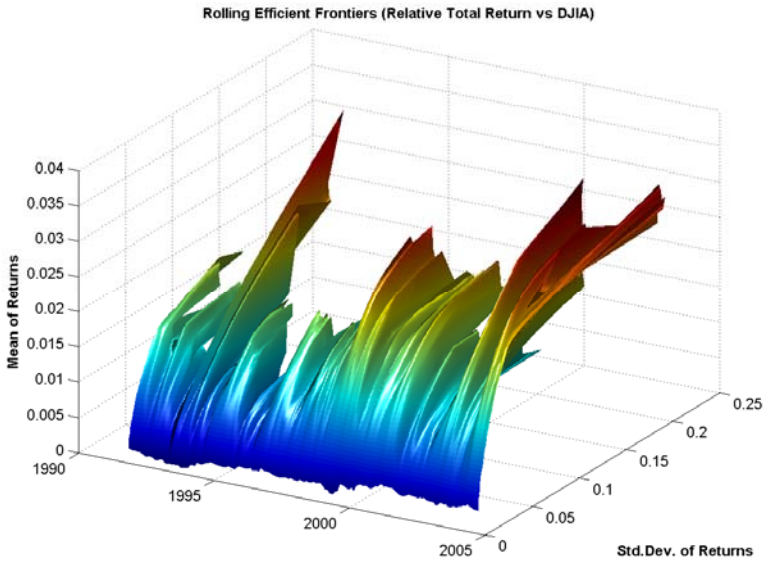
The MathWorks

MATLAB Benefits

- **Solutions to access, explore, and share**
  - A seamless solution
- **Make your programs run faster**
  - The de facto industry-standard, high-level programming language or algorithm development
- **Reduce development time and cost**
  - Earlier project finish or product time to market

Agenda

- Introduction to MATLAB
- Option Pricing
- Reporting
- MATLAB and Excel
- Graphical User Interfaces
- Deployment
- Summary



The Power of MATLAB

MATLAB is both

A Computational Environment

Financial professional develop complex financial models using MATLAB and its family of toolboxes

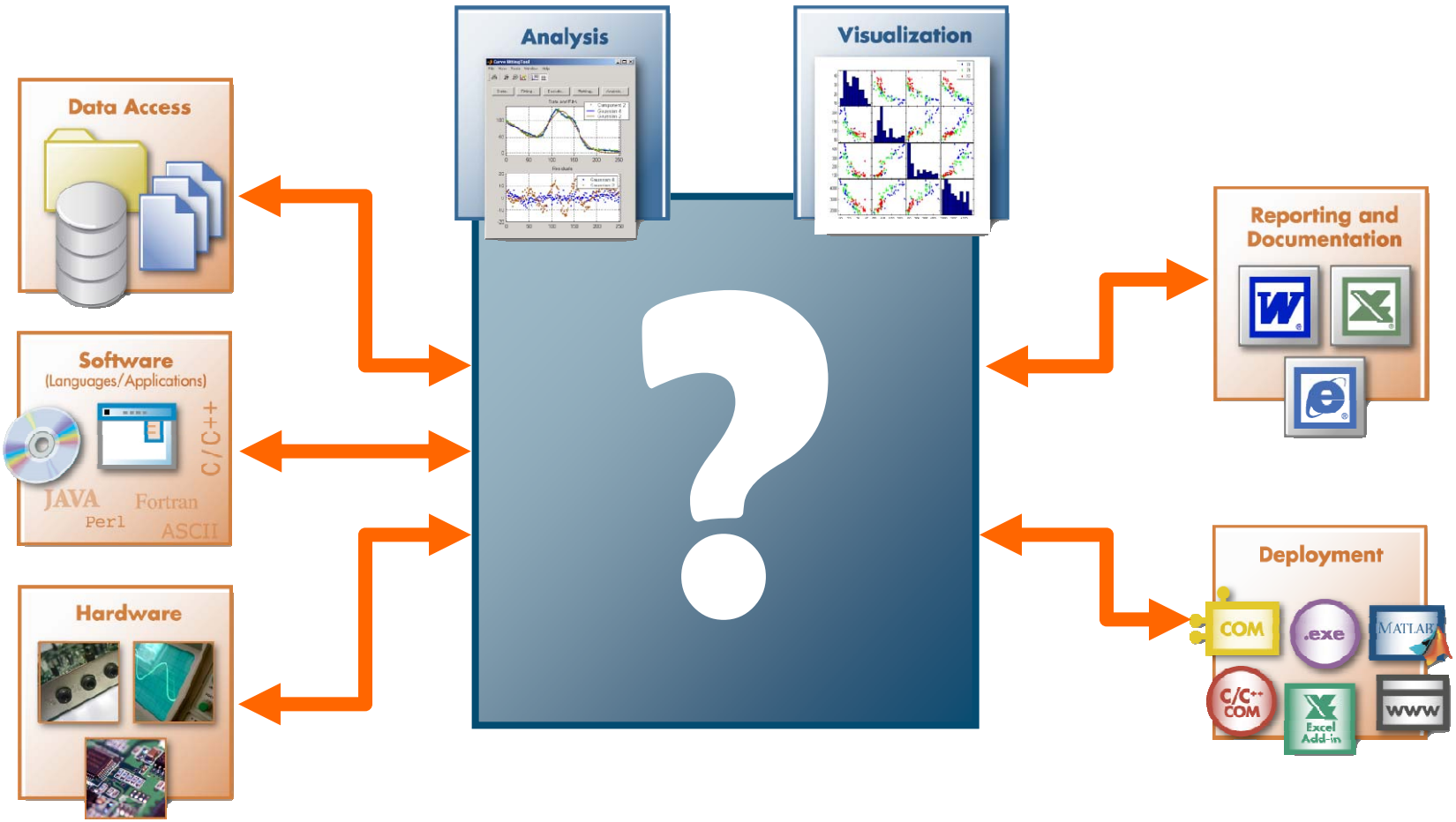
and

An Application Development Environment

Models developed in MATLAB are translated into components using the MATLAB Compiler and distributed as stand-alone applications

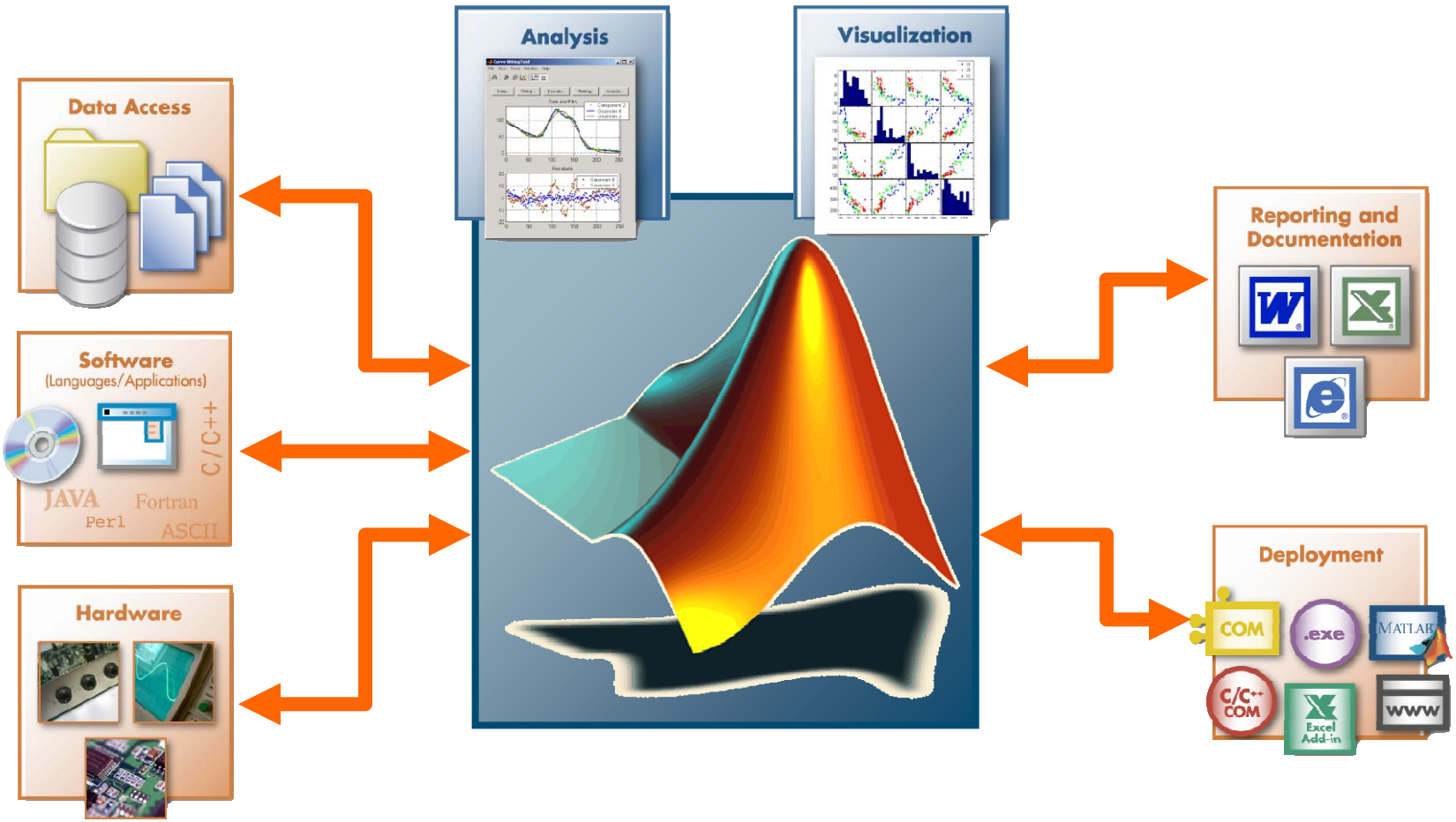
Data Analysis Tasks

Access *Explore* *Share*

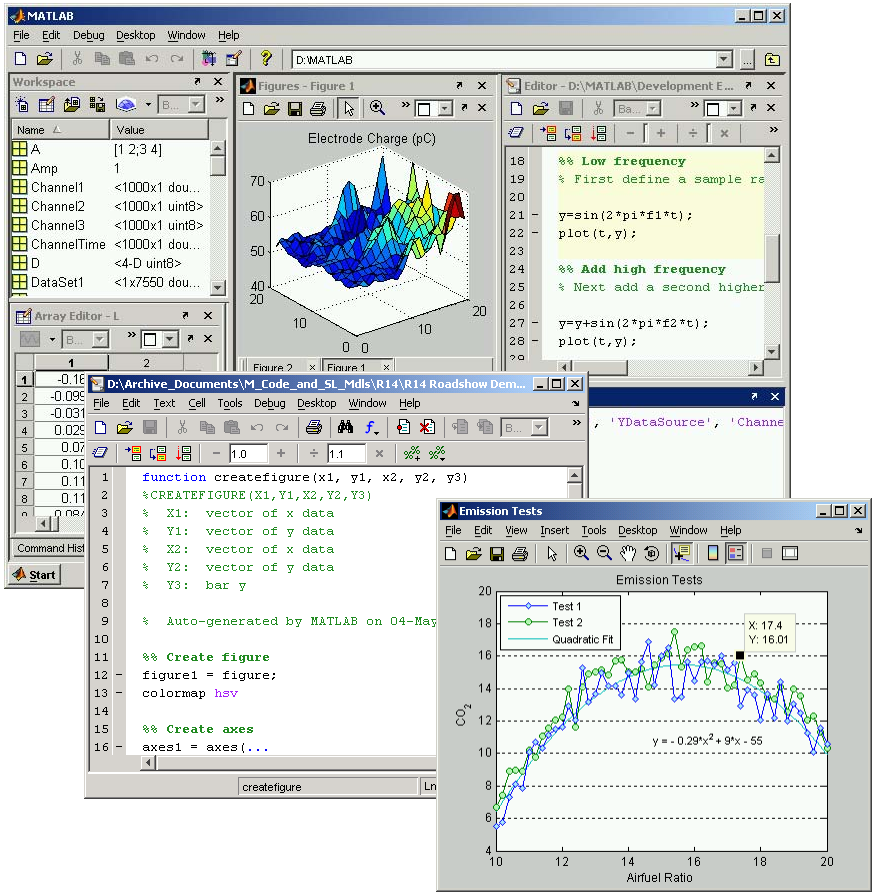


MATLAB for Data Analysis

Access *Explore* *Share*

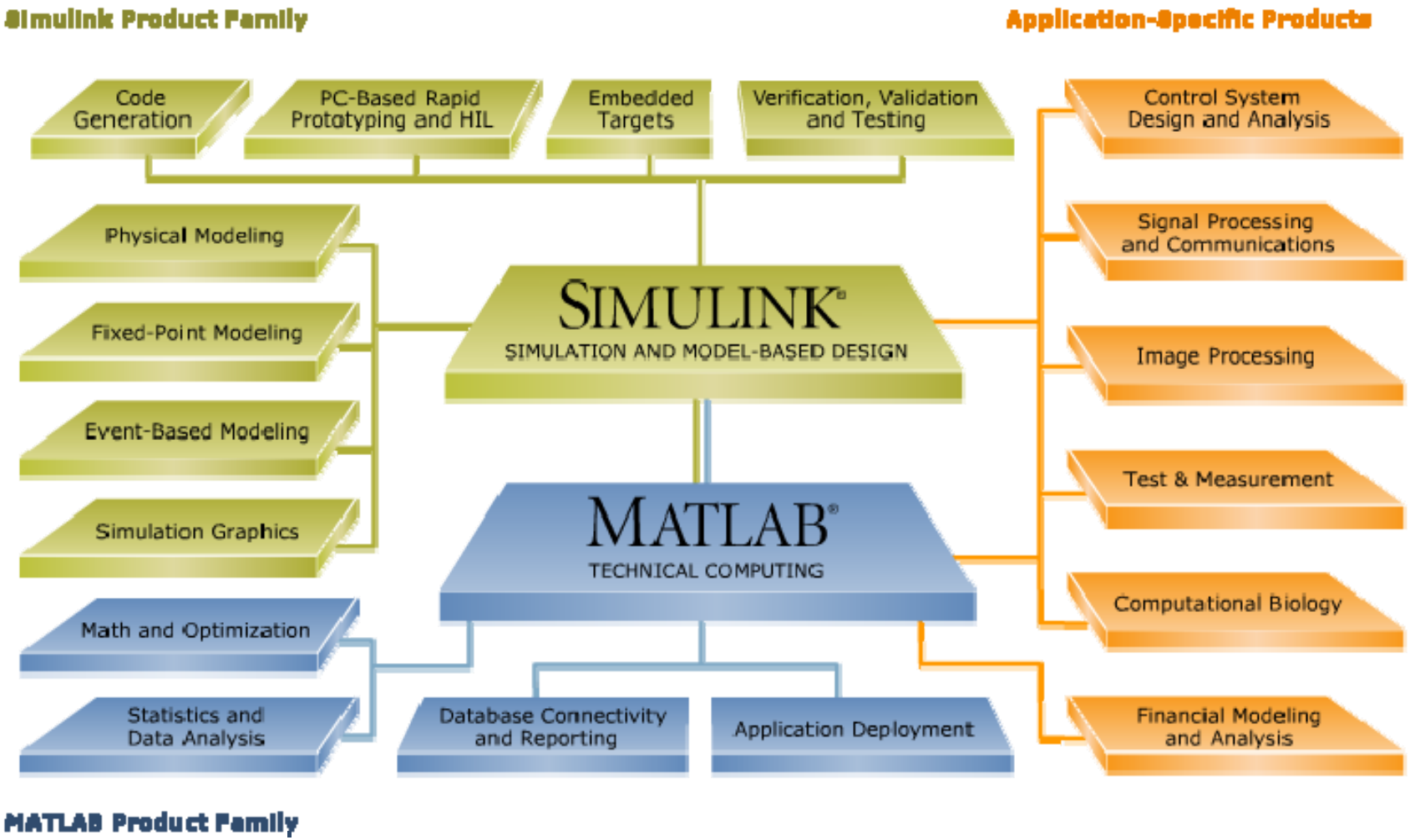


MATLAB Key Features



- High-level technical computing language
- Interactive analysis tools
- Development environment
- Feature areas
  - Mathematics
  - Graphics and GUI Design
  - File I/O
  - Call C/C++, Fortran, Java, COM

The MathWorks Family of Products



Database Toolbox

ORACLE®

Microsoft Access
The Office XP database solution

SYBASE®

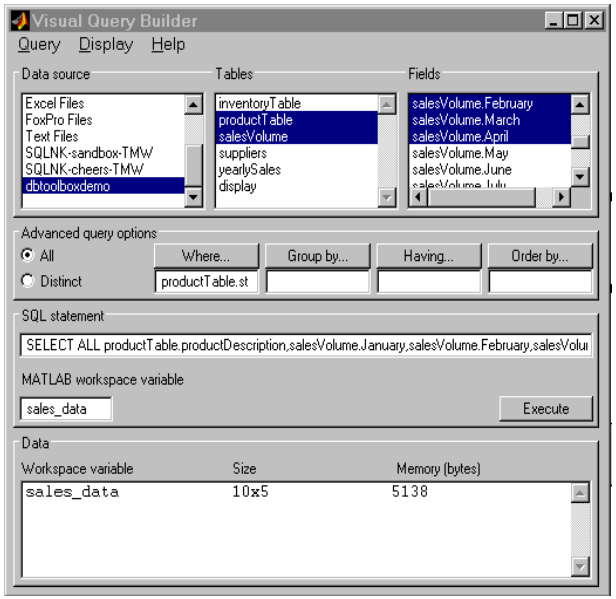
- ODBC or JDBC databases
- Preserve data types

Microsoft® SQL Server™

IBM DB2 Universal

Visual Query Builder

- Data access without knowing SQL
- Build-In visualization

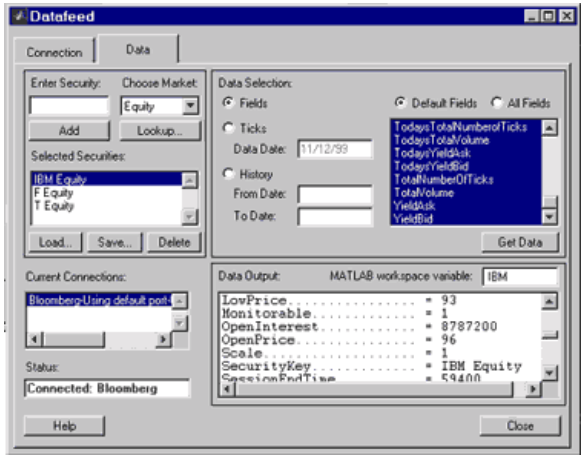


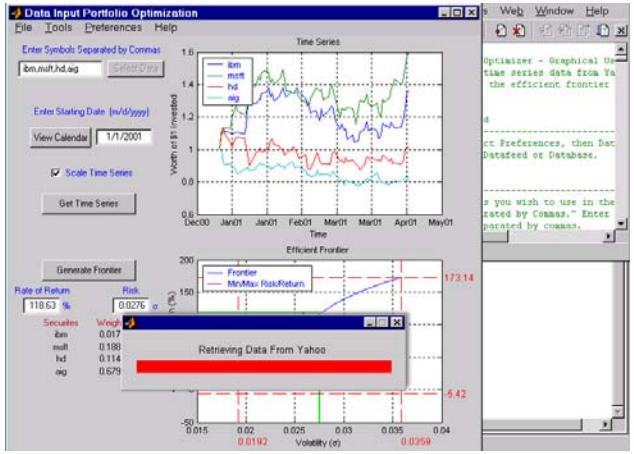
Connecting to Data Providers

Datafeed Toolbox

- supports:
  - Bloomberg
  - FactSet
  - Haver Analytics
  - Hyperfeed
  - Kx Systems
  - Reuters
  - Thomson
  - Yahoo

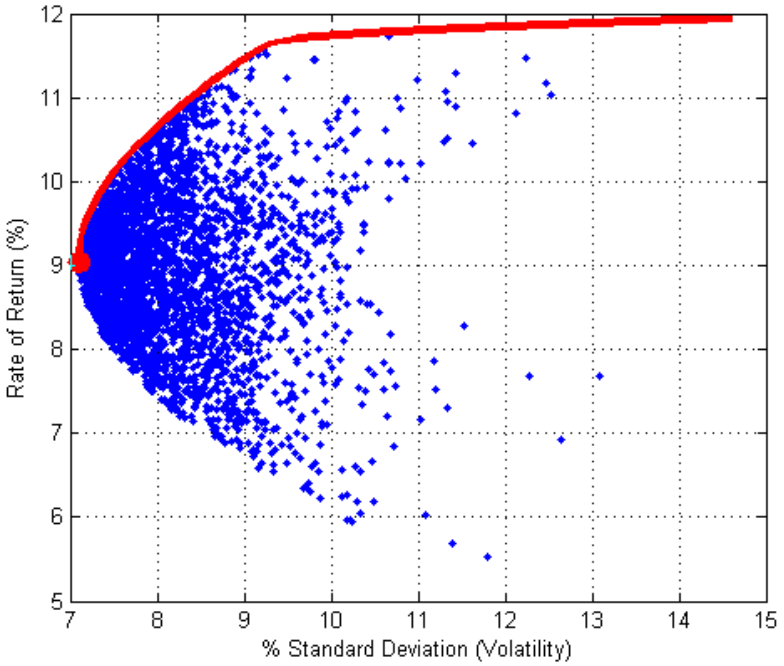
- GUI: DFTOOL





Example: Bootstrapping

Example:
Portfolio Optimization



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Introduction to MATLAB

Option Pricing

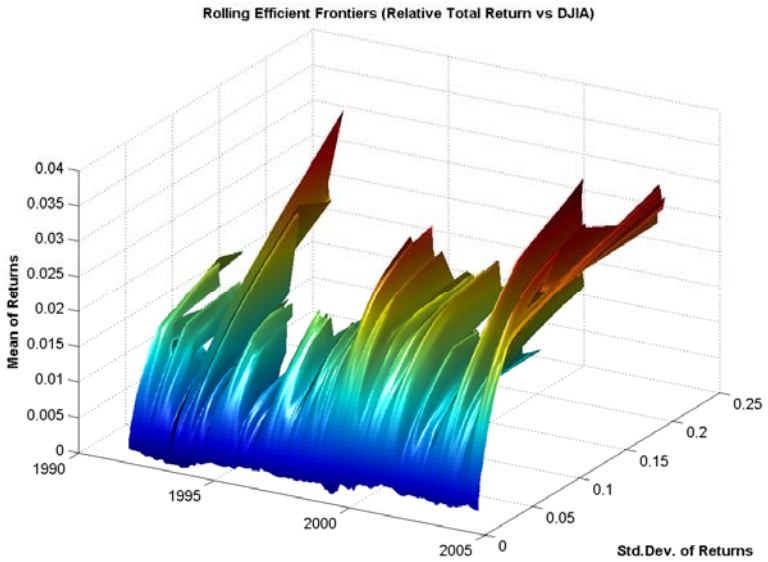
Reporting

MATLAB and Excel

Graphical User Interfaces

Deployment

Summary



Example: Pricing an Asian Option

- The process followed by an asset price path S in a risk-neutral world is:

$$dS = rSdt + \sigma SdW$$

r = Return, σ = Volatility, dW = Brownian motion

- To simulate the paths of future asset prices S, divide the life of the derivative [0; T] into N equal intervals of length t and approximate the equation as:

$$S(t+dt) = S(t)e^{\left(r-\frac{1}{2}\sigma^2\right)dt+\sigma\sqrt{dt}\varepsilon(t)}$$

Normally distributed random variable

Stochastic Differential Equations

SDE engine simulates generalized multivariate stochastic processes

$$dx_t = a(x_t, t)\,dt + b(x_t, t)\,dW_t$$

drift rate — diffusion rate

Special cases: popular models are

- Brownian motion
- Geometric Brownian motion
- Constant elasticity of variance
- Cox-Ingersoll-Ross
- Hull-White/Vasicek

Example:
A Multidimensional Equity Market Model

g[w @ …[wgw. G +[w,^gZ w

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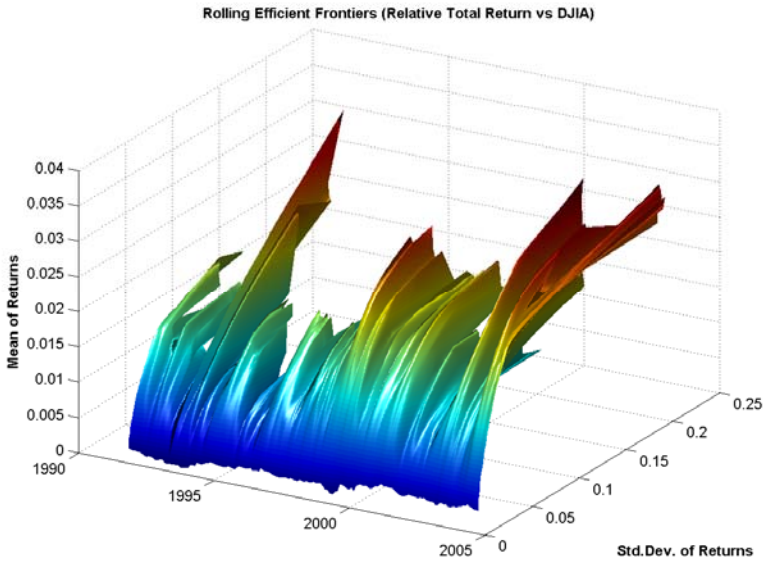
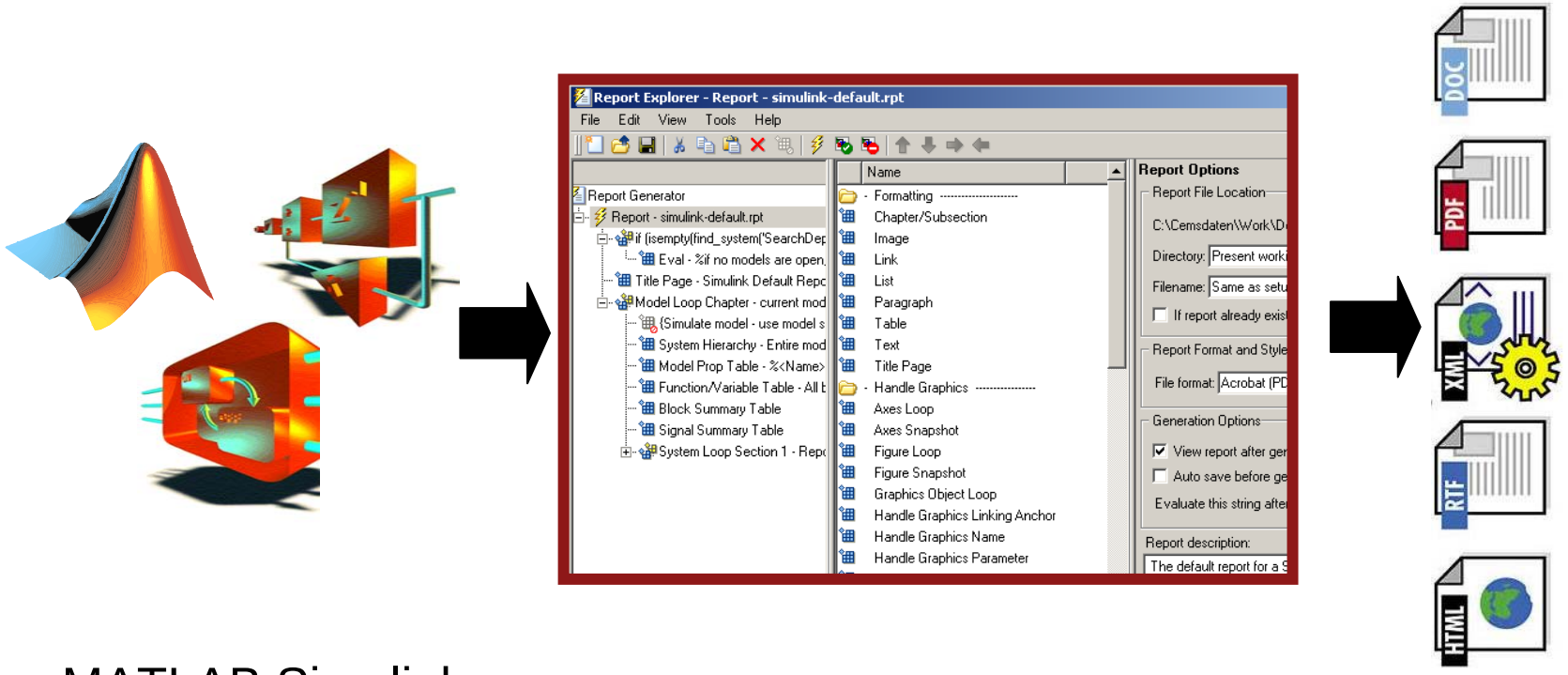


Example: Publishing

Report Generator

- What is it?
  - Automatic documentation for MATLAB, Simulink and Stateflow
- Who can use it?
  - Any MATLAB, Simulink and Stateflow users who need to document their work



MATLAB Simulink Stateflow®

Report Generator

Output Format

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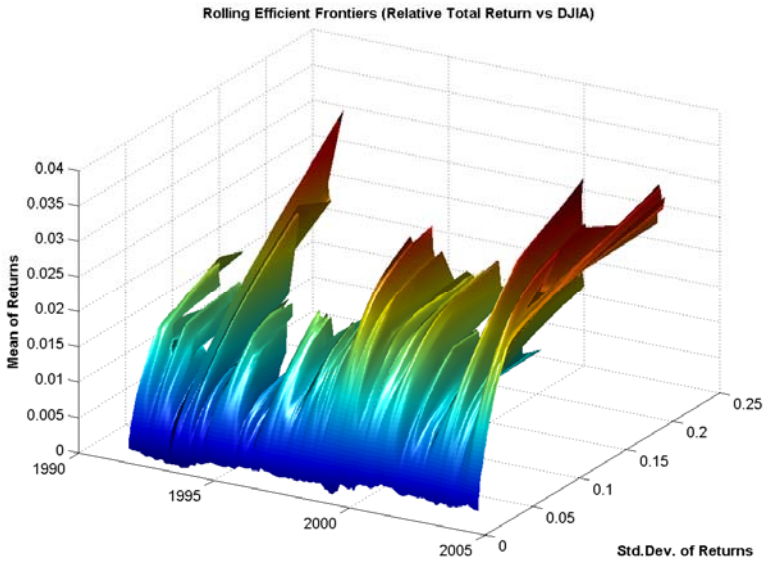
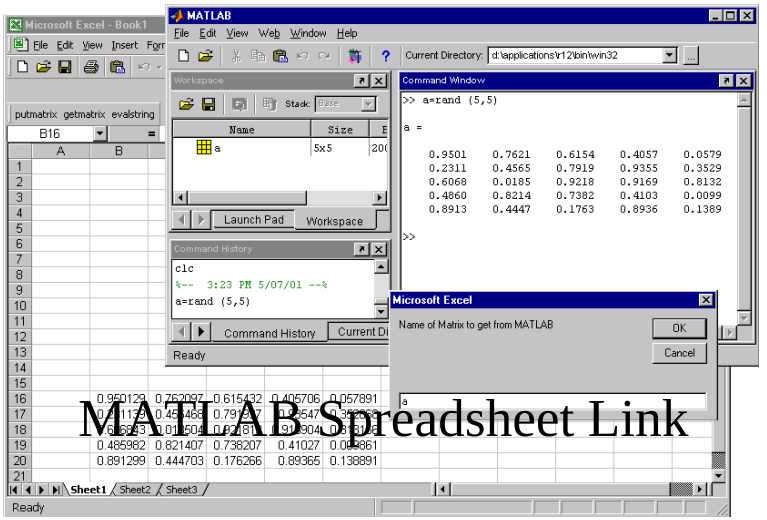


Spreadsheet Link: Interface to Excel

Data I/O

- Import Excel-data to MATLAB
- Export MATLAB-data to Excel
- Execute MATLAB commands from Excel



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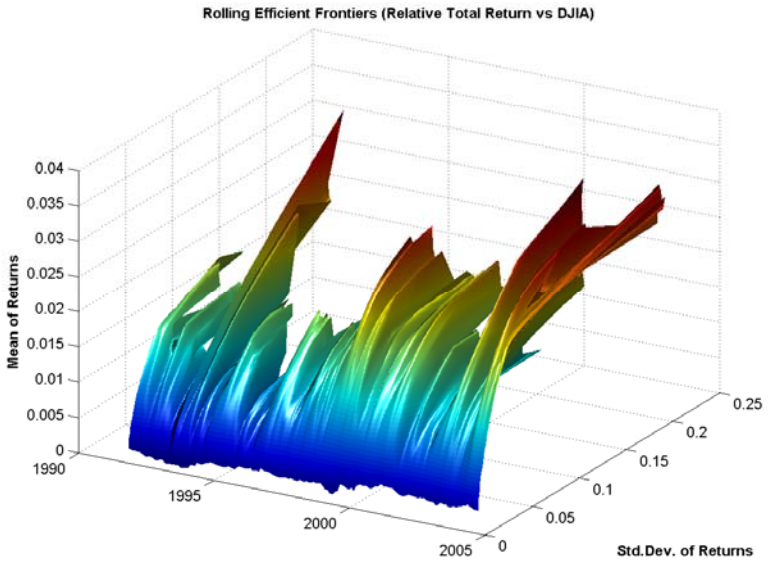

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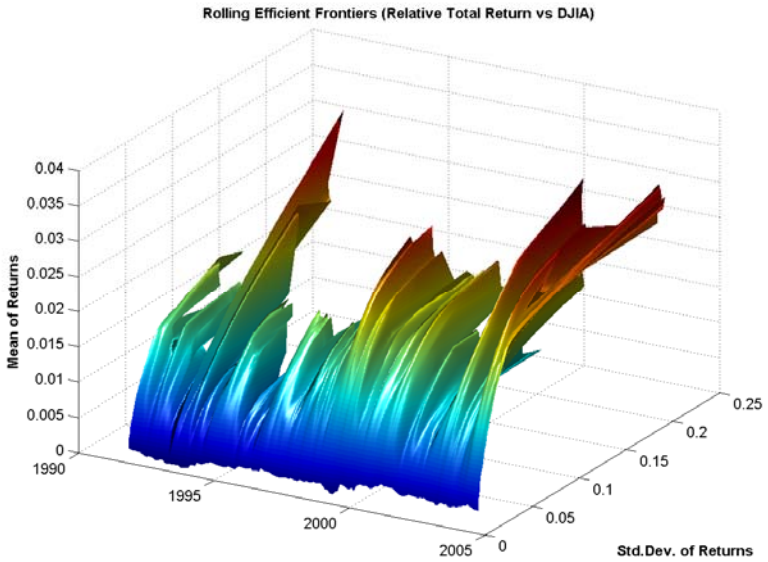
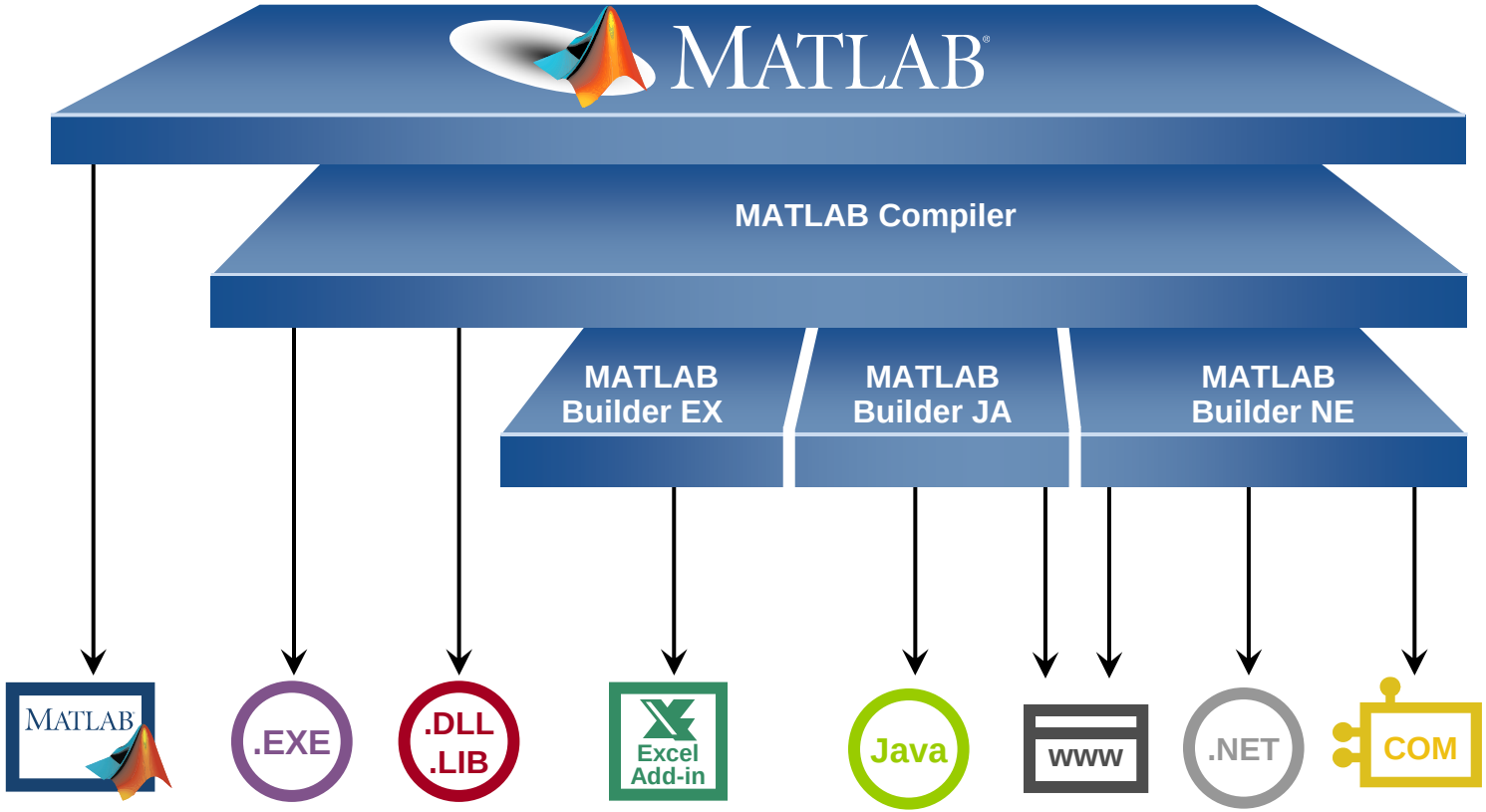
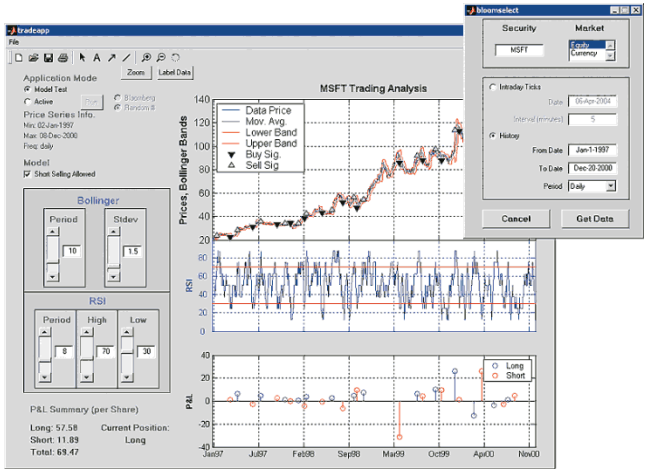


Introduction to MATLAB Deployment Products

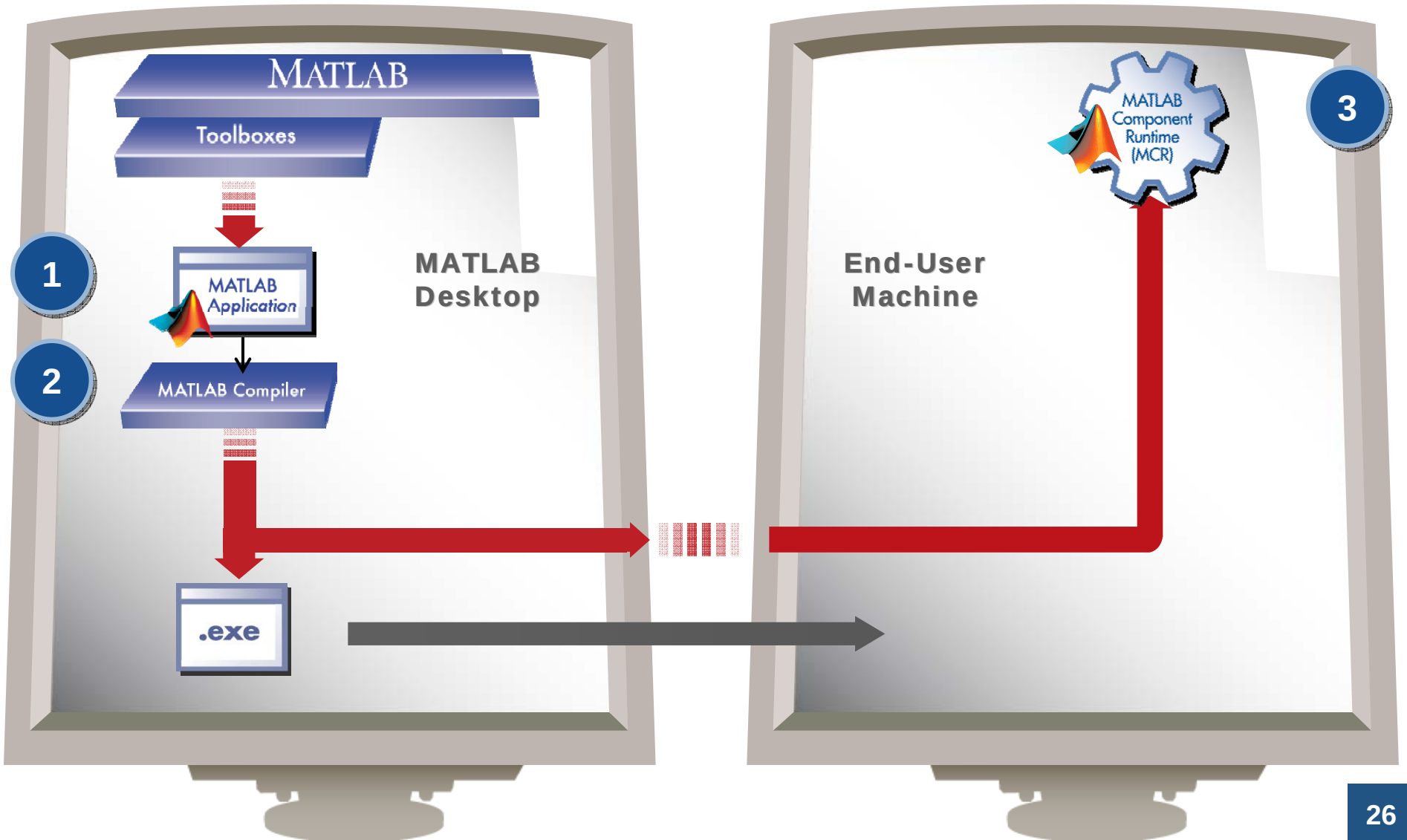


Introduction to MATLAB Compiler

- Automatically converts your MATLAB® programs into *stand-alone applications* and *software components*
- Supports full MATLAB language and most toolboxes
- Royalty-free deployment
- Shared infrastructure with MATLAB:
  - Immediate support of MATLAB features
  - *Speed of compiled application equivalent to speed in MATLAB*

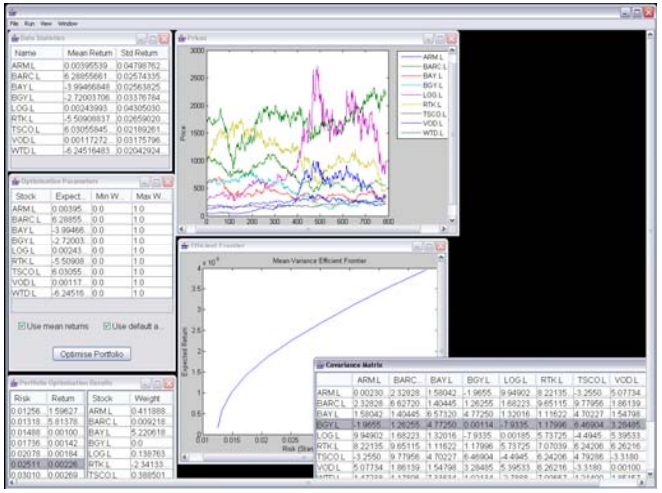


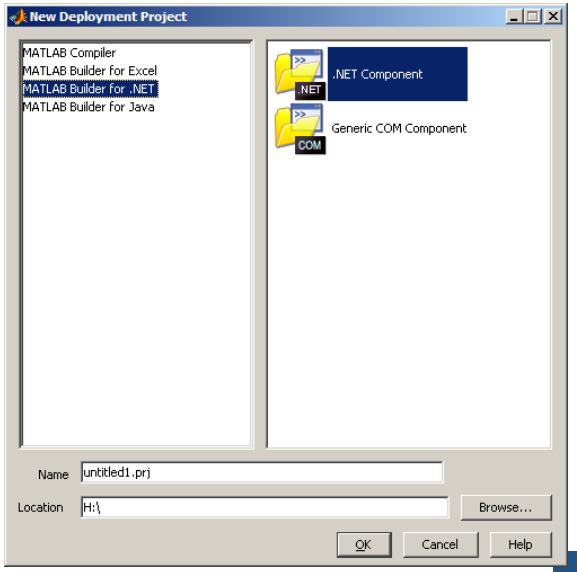
Working with MATLAB Compiler



Working with MATLAB Builders

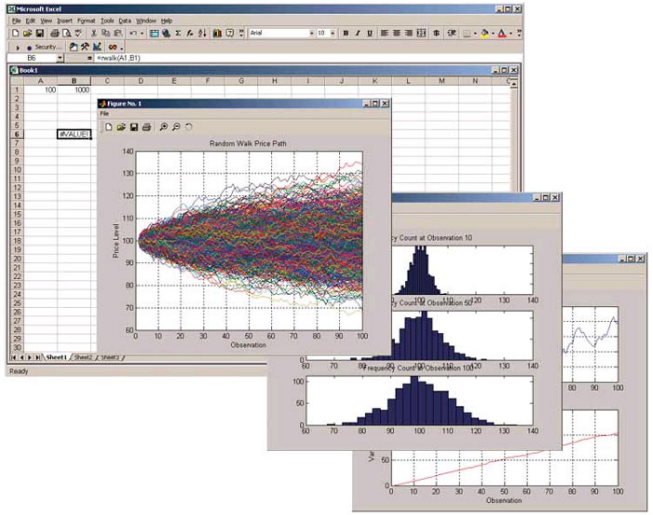
- Builders exist for Java, .NET/COM, and Excel
- Allow you to combine MATLAB based algorithms with applications in other languages or technologies
- Same interface and workflow as MATLAB Compiler
- Automatic wrapping of code for integration in target environment
- Royalty-free deployment



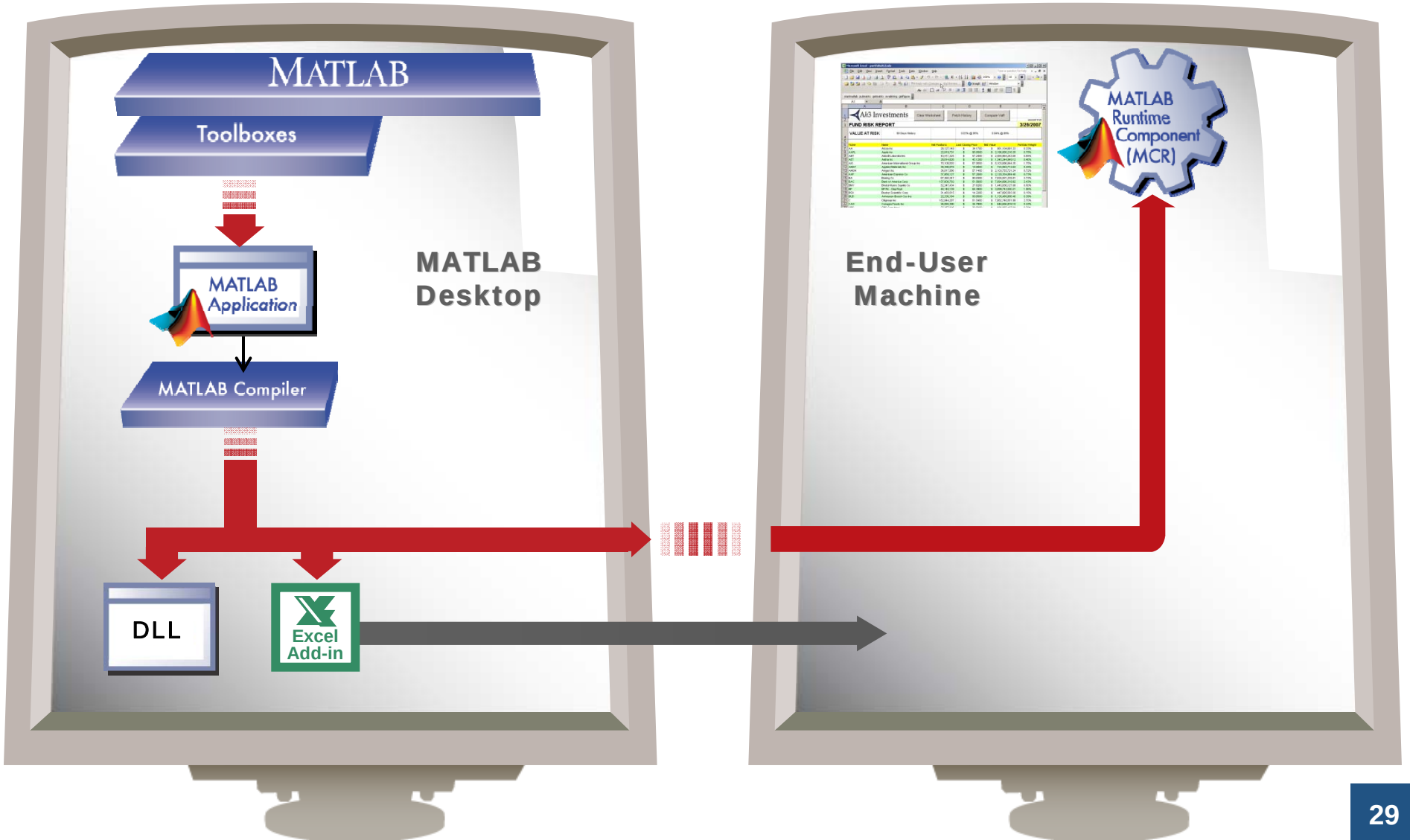


MATLAB Builder EX

- Automatically converts MATLAB algorithms into independent Excel add-ins
- Run up to 20 times faster than Visual Basic add-ins
- Royalty-free deployment model

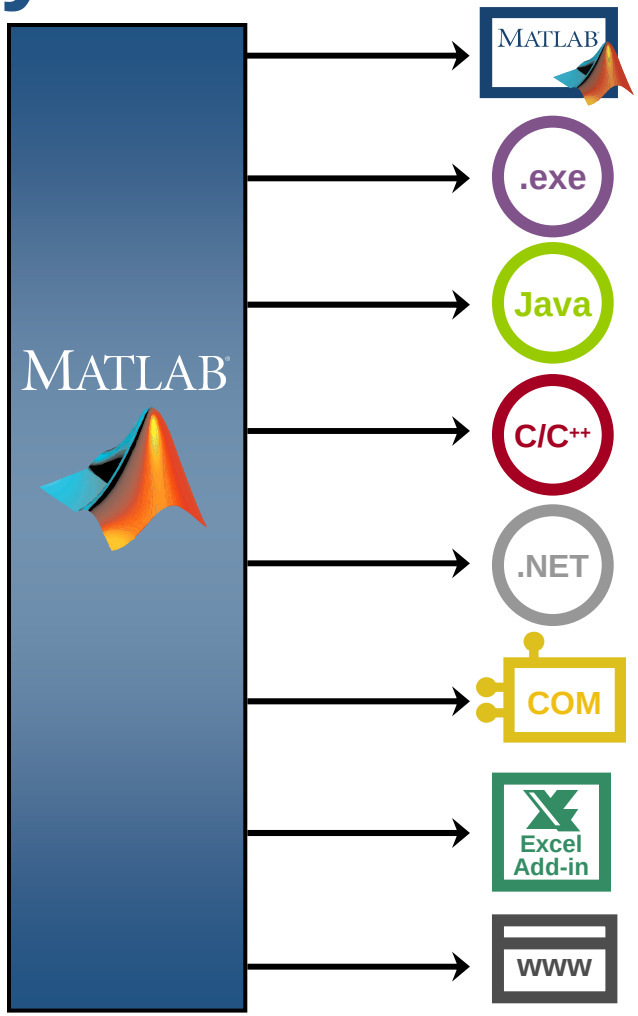


Spreadsheet with Excel Add-In



Summary: MathWorks Deployment Products

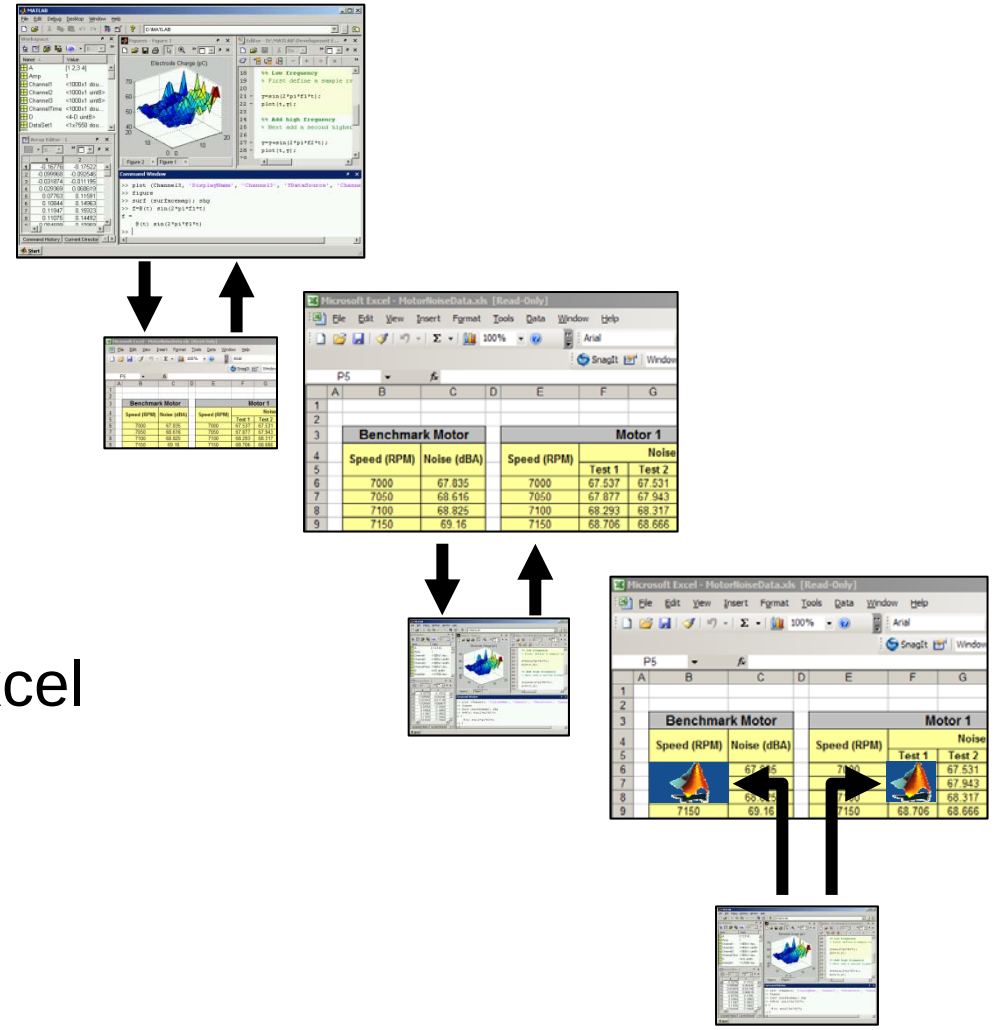
- Convert MATLAB applications into self-contained applications and software components
- Share them with end-users who do not have MATLAB
- Deploy MATLAB algorithms and applications royalty-free



Using MATLAB® with Excel®

Summary

- MATLAB® drives Excel
  - MATLAB
- Excel drives MATLAB
  - MATLAB
  - Spreadsheet Link
- MATLAB deployed in Excel
  - MATLAB
  - MATLAB® Compiler
  - MATLAB® Builder EX



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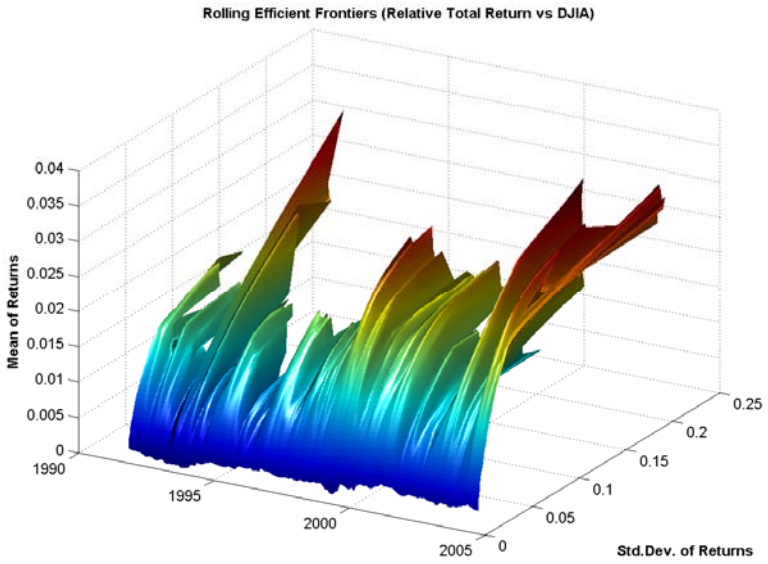
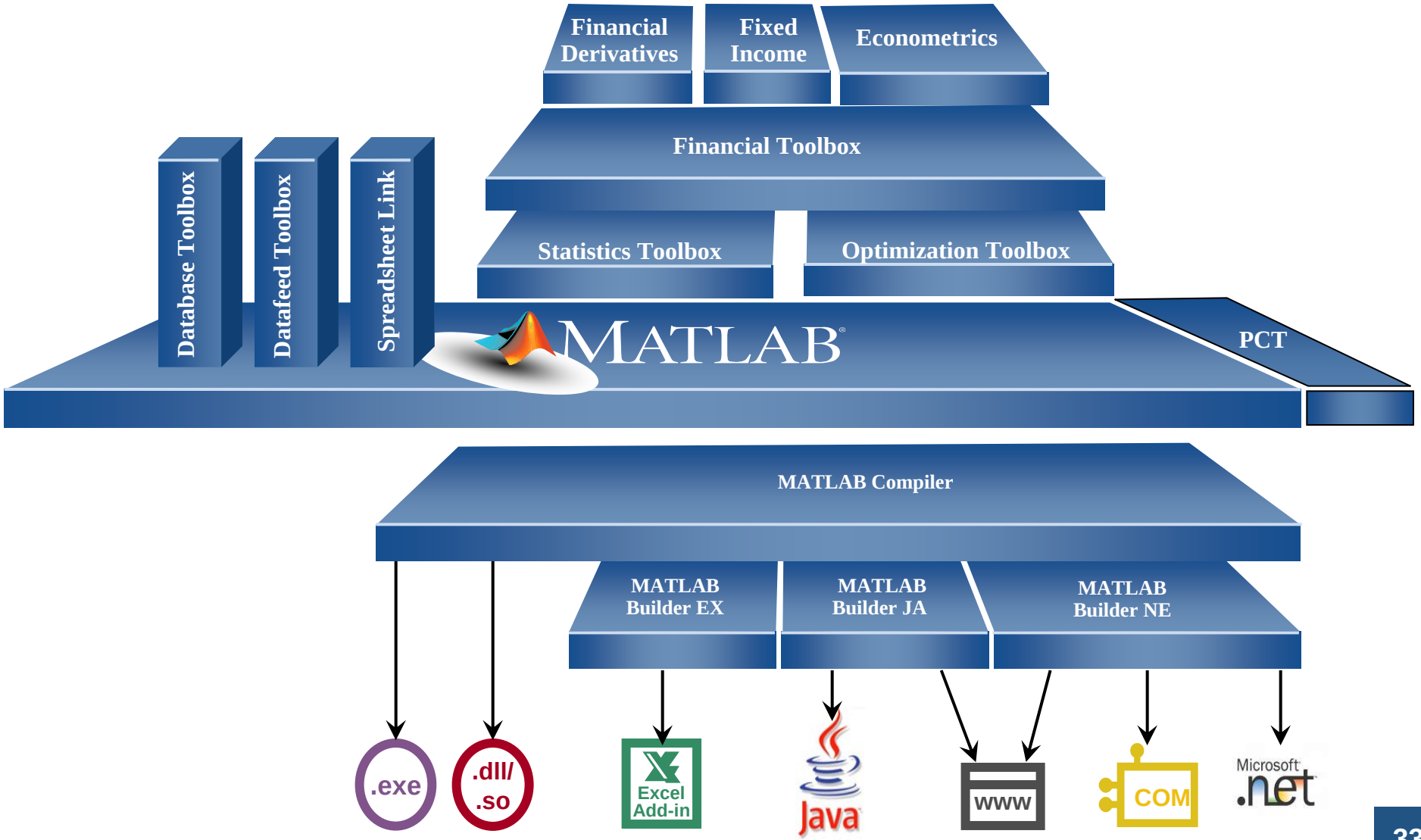


Key Components of Process Flow



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