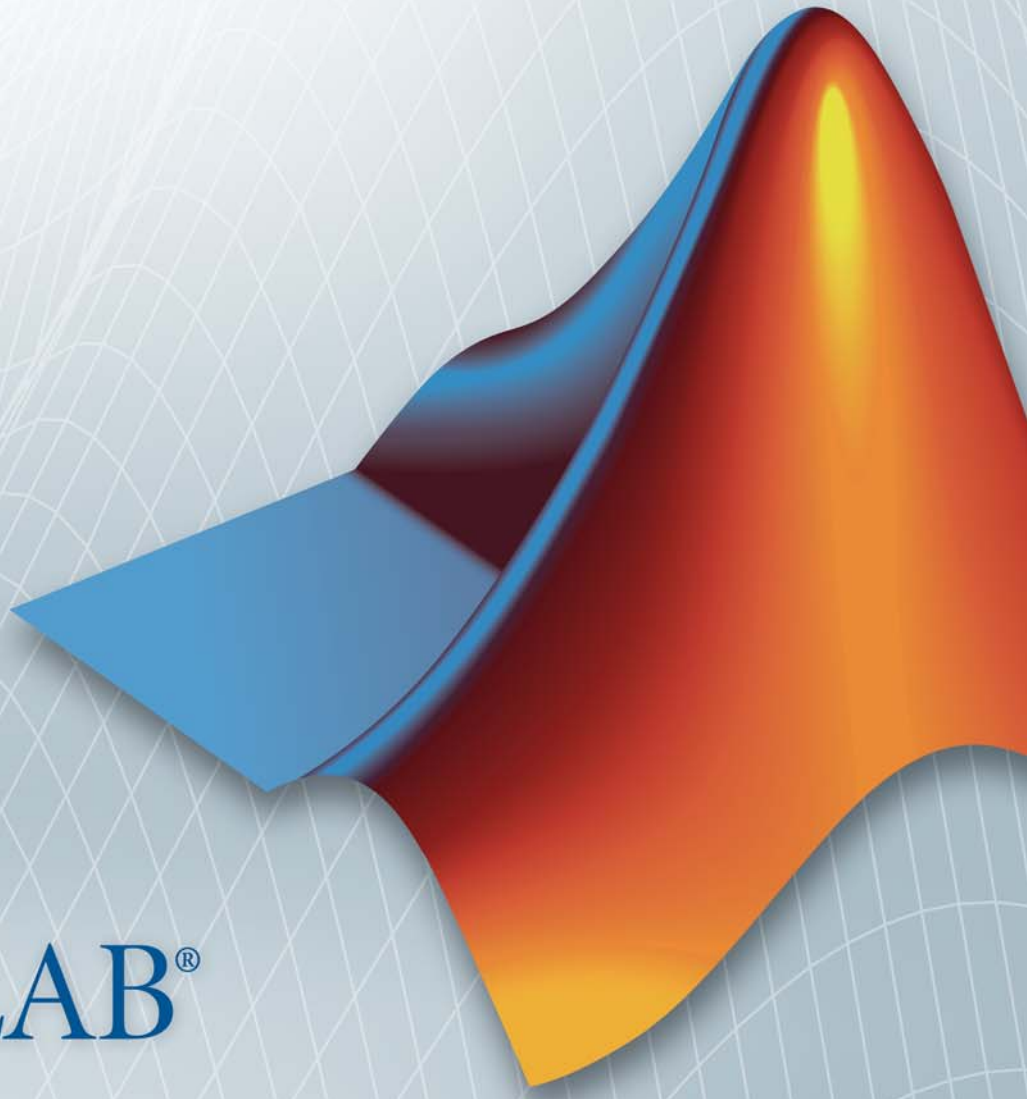
Spreadsheet Link™ EX

User's Guide

R2012a



MATLAB®

MathWorks®

How to Contact MathWorks

`www.mathworks.com`	Web
`comp.soft-sys.matlab`	Newsgroup
`www.mathworks.com/contact_TS.html`	Technical Support

`suggest@mathworks.com`	Product enhancement suggestions
`bugs@mathworks.com`	Bug reports
`doc@mathworks.com`	Documentation error reports
`service@mathworks.com`	Order status, license renewals, passcodes
`info@mathworks.com`	Sales, pricing, and general information

508-647-7000 (Phone)

508-647-7001 (Fax)

The MathWorks, Inc.
3 Apple Hill Drive
Natick, MA 01760-2098

For contact information about worldwide offices, see the MathWorks Web site.

Spreadsheet Link™ EX User's Guide

Trademarks

MATLAB and Simulink are registered trademarks of The MathWorks, Inc. See `www.mathworks.com/trademarks` for a list of additional trademarks. Other product or brand names may be trademarks or registered trademarks of their respective holders.

Patents

MathWorks products are protected by one or more U.S. patents. Please see `www.mathworks.com/patents` for more information.

Revision History

May 1996	First printing	New for Version 1.0
May 1997	Second printing	Revised for Version 1.0.3
January 1999	Third printing	Revised for Version 1.0.8 (Release 11)
September 2000	Fourth printing	Revised for Version 1.1.2
April 2001	Fifth printing	Revised for Version 1.1.3
July 2002	Sixth printing	Revised for Version 2.0 (Release 13)
September 2003	Online only	Revised for Version 2.1 (Release 13SP1)
June 2004	Online only	Revised for Version 2.2 (Release 14)
September 2005	Online only	Revised for Version 2.3 (Release 14SP3)
March 2006	Online only	Revised for Version 2.3.1 (Release 2006a)
September 2006	Online only	Revised for Version 2.4 (Release 2006b)
September 2006	Seventh printing	Revised for Version 2.4 (Release 2006b)
March 2007	Online only	Revised for Version 2.5 (Release 2007a)
September 2007	Online only	Revised for Version 3.0 (Release 2007b)
March 2008	Online only	Revised for Version 3.0.1 (Release 2008a)
October 2008	Online only	Revised for Version 3.0.2 (Release 2008b)
March 2009	Online only	Revised for Version 3.0.3 (Release 2009a)
September 2009	Online only	Revised for Version 3.1 (Release 2009b)
March 2010	Online only	Revised for Version 3.1.1 (Release 2010a)
September 2010	Online only	Revised for Version 3.1.2 (Release 2010b)
April 2011	Online only	Revised for Version 3.1.3 (Release 2011a)
September 2011	Online only	Revised for Version 3.1.4 (Release 2011b)
March 2012	Online only	Revised for Version 3.1.5 (Release 2012a)

Contents

1 Getting Started

2 Solving Problems with the Spreadsheet Link EX Software

3 Error Messages and Troubleshooting

1

Getting Started

Product Description

Use MATLAB® from Microsoft® Excel®

Spreadsheet Link™ EX connects Excel spreadsheet software with the MATLAB workspace, enabling you to access the MATLAB environment from an Excel spreadsheet. With Spreadsheet Link EX software, you can exchange data between MATLAB and Excel, taking advantage of the familiar Excel interface while accessing the computational speed and visualization capabilities of MATLAB.

Key Features

- Data preprocessing, editing, and viewing in the familiar Excel environment
- Sophisticated analysis of Excel data using MATLAB and application toolboxes
- Delivery of Excel based applications, using MATLAB as a computational and graphics engine and Excel as an interface
- Interactive selection of available functions using the MATLAB Function Wizard
- Visual interface for customization of all Spreadsheet Link EX preferences

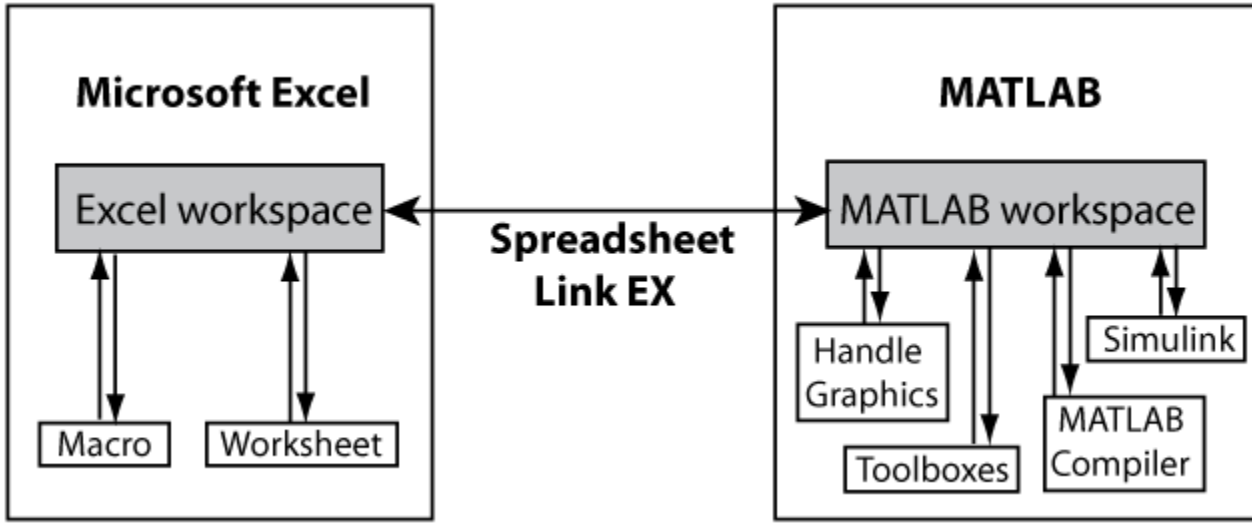
Microsoft Excel and MATLAB Interaction

Spreadsheet Link EX Add-In integrates the Microsoft Excel and MATLAB products in a computing environment running Microsoft Windows®. It connects the Excel interface to the MATLAB workspace, enabling you to use Excel worksheet and macro programming tools to leverage the numerical, computational, and graphical power of MATLAB.

You can use Spreadsheet Link EX functions in an Excel worksheet or macro to exchange and synchronize data between Excel and MATLAB, without leaving the Excel environment. With a small number of functions to manage the link and manipulate data, the Spreadsheet Link EX software is powerful in its simplicity.

Note This documentation uses the terms *worksheet* and *spreadsheet* interchangeably.

The Spreadsheet Link EX software supports MATLAB two-dimensional numeric arrays, one-dimensional character arrays (strings), and two-dimensional cell arrays. It does not work with MATLAB multidimensional arrays and structures.


Microsoft Excel
Excel workspace
Macro
Worksheet
Spreadsheet
Link EX
MATLAB
MATLAB workspace
Handle
Graphics
Toolboxes
MATLAB
Compiler
Simulink

Installation

In this section...

Product Installation

Install the Microsoft Excel product *before* you install the MATLAB and Spreadsheet Link EX software. To install the Spreadsheet Link EX Add-In, follow the instructions in the MATLAB installation documentation. Select the **Spreadsheet Link EX** check box when choosing components to install.

Note If you have several versions of MATLAB installed on your computer, Spreadsheet Link EX software uses the version that you registered last.

Files and Folders Created by the Installation

Note Throughout this document the notation *`matlabroot`* is the MATLAB root folder, the folder where the MATLAB software is installed on your system.

The Spreadsheet Link EX installation program creates a subfolder under *`matlabroot`*`\toolbox\`. The `exlink` folder contains the following files:

- `excllink.xla`: The Spreadsheet Link EX Add-In for Microsoft Excel 2003 and earlier versions
- `excllink2007.xlam`: The Spreadsheet Link EX Add-In for Microsoft Excel 2007 or 2010
- `ExliSamp.xls`: Spreadsheet Link EX example files described in this documentation

The Spreadsheet Link EX software uses `Kernel32.dll`, which should already be in the appropriate Windows system folder (for example, `C:\Winnt\system32`). If not, consult your system administrator.

Modifying Your System Path

Add *`matlabroot`*`\bin` to your system path. For more information about editing your system path, consult your Windows documentation or your system administrator.

After You Upgrade the Spreadsheet Link EX Software

If MATLAB and Spreadsheet Link EX are installed on your computer, to upgrade to a newer version:

1. Install the new version of MATLAB and the Spreadsheet Link EX software.
2. Start MATLAB and a Microsoft Excel session.
3. Configure the Spreadsheet Link EX software.
4. If you have existing workbooks with macros that use the Spreadsheet Link EX software, update the references to the Spreadsheet Link EX software in each workbook.

To update the references in an existing workbook in Microsoft Excel 2003 or earlier versions:

1. In a Microsoft Excel session, open the Visual Basic® Editor window by selecting **Tools > Macros > Visual Basic Editor**.
2. In the left pane, select a module for which you want to update a reference.
3. From the main menu, select **Tools > References**.
4. In the References dialog box, select the **SpreadsheetLinkEX** check box.
5. Click **OK**.

To update the references in an existing workbook in Microsoft Excel 2007 or 2010:

1. In a Microsoft Excel session, open the Visual Basic Editor window by clicking **Visual Basic** on the **Developer** tab. (If you do not find the **Developer** tab, see the Excel Help.)
2. In the left pane, select a module for which you want to update a reference.
3. From the main menu, select **Tools > References**.
4. In the References dialog box, select the **SpreadsheetLink2007_2010** check box.
5. Click **OK**.

Add-in Setup

In this section...

Configuring Microsoft Excel 2003 and Earlier Versions

To enable the Spreadsheet Link EX Add-In, start Microsoft Excel and follow these steps:

1. Click **Tools > Add-Ins**. The Add-Ins dialog box appears.
2. Click **Browse**.
3. Select *`matlabroot`*`\toolbox\exlink\excllink.xla`.

   Note Throughout this document the notation *`matlabroot`* is the MATLAB root folder, the folder where the MATLAB software is installed on your system.

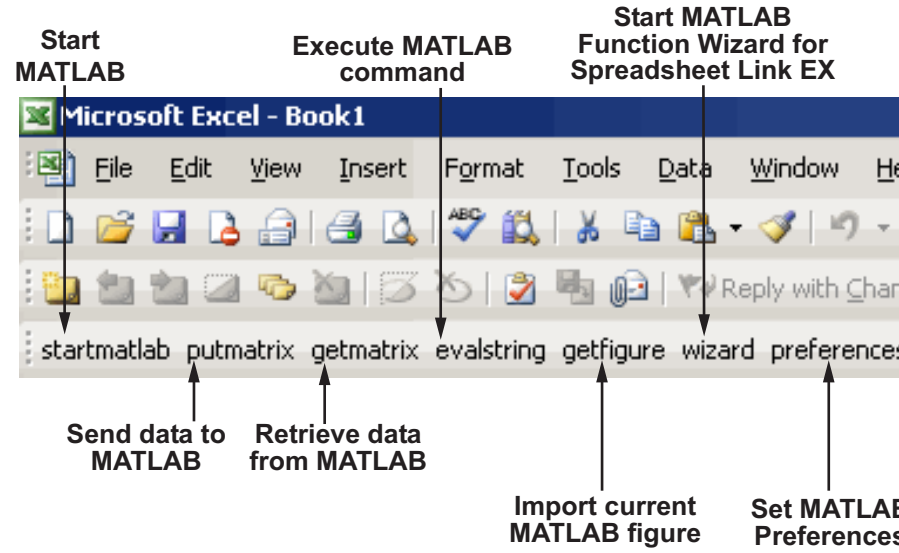
4. Click **OK**.

   In the Add-Ins dialog box, the **Spreadsheet Link EX for use with MATLAB** check box is now selected.
5. Click **OK** to exit the Add-Ins dialog box.

The Spreadsheet Link EX Add-In loads now and with each subsequent Excel session.

The **MATLAB Command Window** button appears on the Microsoft Windows taskbar.

The Spreadsheet Link EX toolbar appears on your Excel worksheet.



The Spreadsheet Link EX software is now ready for use.

Configuring Microsoft Excel 2007 and 2010

To enable the Spreadsheet Link EX Add-In, start a Microsoft Excel session and follow these steps. If you use Microsoft Excel 2007:

1 Click  , the Microsoft Office Button.

2 Click **Excel Options**. The Excel Options dialog box appears.

If you use Microsoft Excel 2010:

1 Select **File** from the main menu.

2 Click **Options**. The Excel Options dialog box appears.

The next steps are the same for both versions:

3 Click **Add-Ins**.

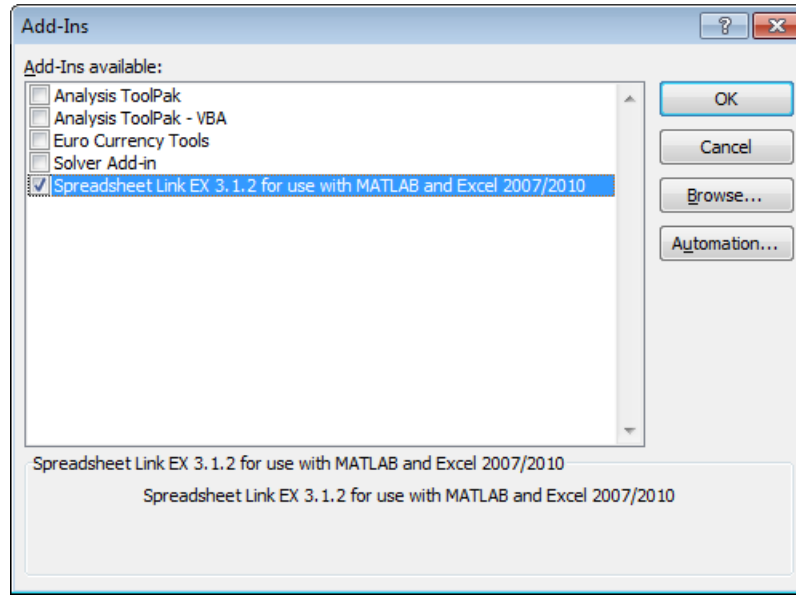
4 From the **Manage** selection list, choose **Excel Add-Ins**.

5 Click **Go**. The Add-Ins dialog box appears.

6 Click **Browse**.

7 Select *`matlabroot`*`\toolbox\exlink\excllink2007.xlam`.

8 Click **Open**. In the Add-Ins dialog box, the **Spreadsheet Link EX for use with MATLAB** check box is now selected.



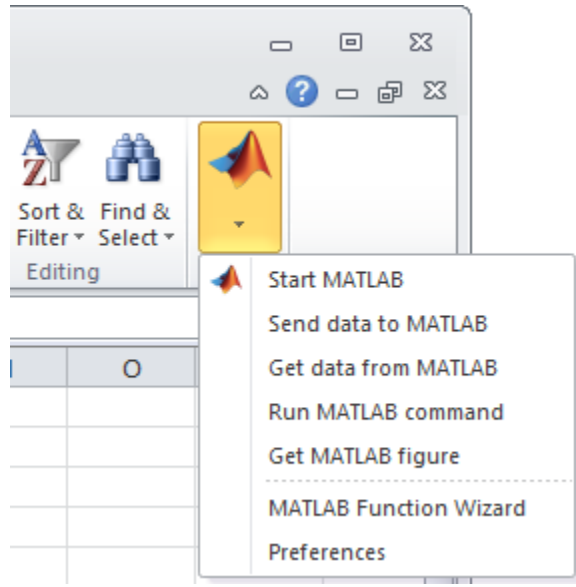
9 Click **OK** to close the Add-Ins dialog box.

10 Click **OK** to close the Excel Options dialog box.

The Spreadsheet Link EX Add-In loads now and with each subsequent Excel session.

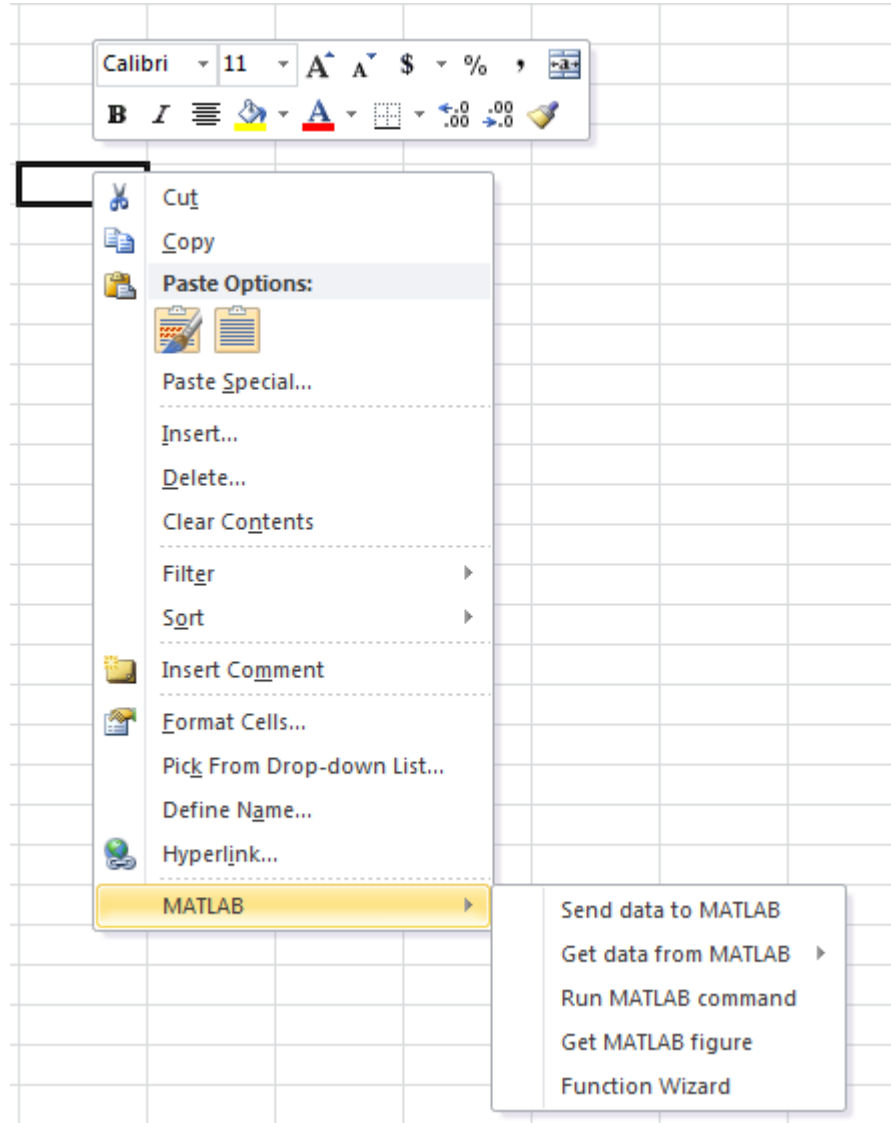
The **MATLAB Command Window** button appears on the Microsoft Windows taskbar.

The MATLAB group appears on the top right of the Home tab in your Excel worksheet:



The Spreadsheet Link EX software is now ready for use.

Right-click a cell for MATLAB options. The following menu appears:


Calibri
11
Cut
Copy
Paste Options:
Paste Special...
Insert...
Delete...
Clear Contents
Filter
Sort
Insert Comment
Format Cells...
Pick From Drop-down List...
Define Name...
Hyperlink...
MATLAB
Send data to MATLAB
Get data from MATLAB
Run MATLAB command
Get MATLAB figure
Function Wizard

Caution Using both the 2003 and 2007/2010 Add-Ins referenced in Excel 2007/2010 causes problems with the context-sensitive menu. Use only one Add-In at a time to avoid this issue.

Working with the Microsoft Visual Basic Editor

Follow these steps to enable the Spreadsheet Link EX software as a Reference in the Microsoft Visual Basic Editor:

1. Open a Visual Basic session.
   - If you are running the Excel 2003 software, click **Tools > Macro > Visual Basic Editor**.
   - If you are running the Excel 2007 or 2010 software, click the Visual Basic button () on the **Developer** tab, or press **Alt+F11**.

   Note For instructions how to display the Developer tab, see Excel Help.

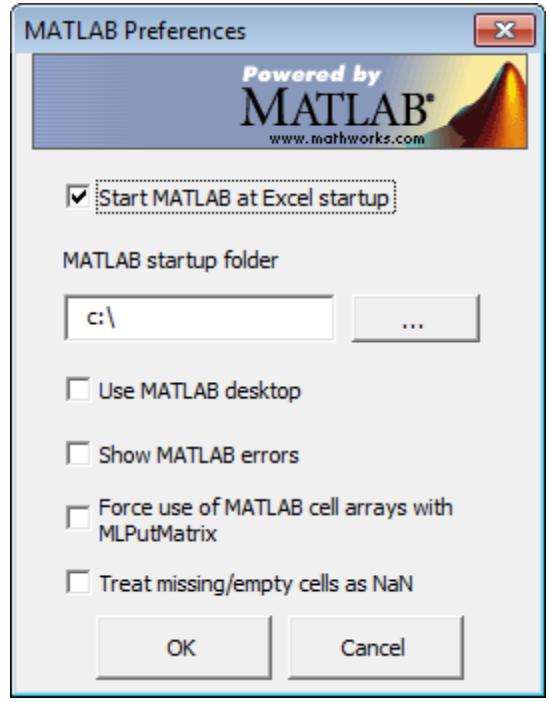
2. In the Visual Basic toolbar, click **Tools > References**.
3. In the References — VBA Project dialog box, select the **SpreadsheetLinkEX** or **SpreadsheetLink2007_2010** check box.
4. Click **OK**.

Customization

In this section...

Setting Spreadsheet Link EX Preferences

Use the Preferences dialog box to set Spreadsheet Link EX preferences. Click the **preferences** button in the Excel toolbar or MATLAB group to open this dialog box.



Preferences include:

- **Start MATLAB at Excel startup** starts a MATLAB session automatically when an Excel session starts. By default, this option is enabled.
- **MATLAB startup folder** lets you specify the startup folder for your MATLAB session.
- **Use MATLAB desktop** starts the MATLAB desktop, including the current folder, workspace, command history, and Command Window panes, when an Excel session starts.
- **Show MATLAB errors** displays MATLAB error messages in Excel worksheet cells. Without this option, worksheet cells display Excel error messages. See "Worksheet Cell Errors" on page 3-2.
- **Force use of MATLAB cell arrays with MLPutMatrix** enables the `MLPutMatrix` function to use cell arrays for data transfer between the Excel software and the MATLAB workspace.
- **Treat missing/empty cells as NaN** sets data in missing or empty cells to `NaN` or zero.

Using Particular Versions of MATLAB

If there are several versions on MATLAB installed on your computer, the Spreadsheet Link EX software uses the last registered version. Typically, the last registered version is the latest version you have installed. To change the last registered version of MATLAB:

1. Shut down all MATLAB and Excel sessions.
2. Open a Command Prompt window, and using `cd`, change to the `bin\win64` or `bin\win32` subfolder of the MATLAB installation folder.
3. Enter the command:

```
.\matlab /regserver
```

Startup and Shutdown

In this section...

Automatically Starting the Spreadsheet Link EX Software

When installed and configured according to the instructions in "Add-in Setup" on page 1-8, the Spreadsheet Link EX and MATLAB software automatically start when you start a Microsoft Excel session.

Manually Starting the Spreadsheet Link EX Software

To start the Spreadsheet Link EX and MATLAB software manually from the Excel interface:

1. Click **Tools > Macro**. (In Excel 2007, click the **View** tab or the **Developer** tab, and then click the **Macros** button.)
2. Enter `matlabinit` into the **Macro Name/Reference** box.

   For more information about the `matlabinit` function, see Chapter 4, "Function Reference".
3. Click **Run**. The MATLAB Command Window button appears on the Microsoft Windows taskbar.

Connecting to Already Running MATLAB Session

By default, Spreadsheet Link EX starts a new MATLAB session. Alternatively, it can connect to an already running MATLAB session.

Note If there are several versions of MATLAB installed on your computer, Spreadsheet Link EX always uses the last registered version. If you try to connect to an already running MATLAB session that is not the last registered version, Spreadsheet Link EX starts a new MATLAB session rather than connecting to the existing one. See how to change the last registered version in "Using Particular Versions of MATLAB" on page 1-15.

To connect a new Excel session to already running MATLAB session:

1. In MATLAB, enter the following command:

   ```
   enableservice('AutomationServer', true)
   ```

   This command converts a running MATLAB session into an Automation server.

2. Start a new Excel session. It automatically connects to the running MATLAB session.

Alternatively, you can start MATLAB as an automation server from the beginning. To start MATLAB as an automation server, use the `automation` command-line option:

```
matlab -automation
```

This command does not start MATLAB in a full desktop mode. To start MATLAB in a full desktop mode, use the `-desktop` option:

```
matlab -automation -desktop
```

If you always use MATLAB as an automation server, modify the shortcut that you use to start MATLAB:

1. Right-click your MATLAB shortcut icon. (You can use the icon on your desktop or in the Windows **Start** menu.)

2. Select **Properties**.

3. Click the **Shortcut** tab.

4 Add the string `-automation` in the **Target** field. Remember to leave a space between `matlab.exe` and `/automation`.

5 Click **OK**.

Stopping the Spreadsheet Link EX Software

If you started the Spreadsheet Link EX and MATLAB software from the Excel interface:

- To stop both the Spreadsheet Link EX and MATLAB software, close the Excel session as you normally would.
- To stop the Spreadsheet Link EX and MATLAB software and leave the Excel session running, enter the `=MLClose()` command into an Excel worksheet cell. You can use the `MLOpen` or `matlabinit` functions to restart the Spreadsheet Link EX and MATLAB sessions manually.

If you connected an Excel session to an existing MATLAB session, close Excel and MATLAB sessions separately. Closing one session does not automatically close the other.

Using MATLAB Functions in Microsoft Excel

In this section...

How Spreadsheet Link EX Functions Differ from Microsoft Excel Functions

- Spreadsheet Link EX functions *perform an action*, while Microsoft Excel functions *return a value*.
- Spreadsheet Link EX function names *are not* case sensitive; that is, `MLPutMatrix` and `mlputmatrix` are the same.
- MATLAB function names and variable names *are* case sensitive; that is, `BONDS`, `Bonds`, and `bonds` are three different MATLAB variables.

Note Excel operations and function keys may behave differently with Spreadsheet Link EX functions.

Types of Spreadsheet Link EX Functions

Spreadsheet Link EX functions manage the connection and data exchange between the Excel software and the MATLAB workspace, without your ever needing to leave the Excel environment. You can run functions as worksheet cell formulas or in macros. The Spreadsheet Link EX software enables the Excel product to act as an easy-to-use data-storage and

application-development front end for the MATLAB software, which is a powerful computational and graphical processor.

There are two types of Spreadsheet Link EX functions: link management functions and data management functions.

Link management functions initialize, start, and stop the Spreadsheet Link EX and MATLAB software. You can run any link management function other than `matlabinit` as a worksheet cell formula or in macros. You must run the `matlabinit` function from the Excel **Tools > Macro** menu, or in macro subroutines.

Data management functions copy data between the Excel software and the MATLAB workspace, and execute MATLAB commands in the Excel interface. You can run any data management function other than `MLPutVar` and `MLGetVar` as a worksheet cell formula or in macros. The `MLPutVar` and `MLGetVar` functions can run only in macros.

For more information about Spreadsheet Link EX functions, see Chapter 4, "Function Reference".

Using Worksheets

Entering Functions into Worksheet Cells

Spreadsheet Link EX functions expect A1-style worksheet cell references; that is, columns designated with letters and rows with numbers (the default reference style). If your worksheet shows columns designated with numbers instead of letters:

1. Click **Tools > Options**.
2. Click the **General** tab.
3. Under **Settings**, clear the **R1C1 reference style** check box.

Enter Spreadsheet Link EX functions directly into worksheet cells as worksheet formulas. Begin worksheet formulas with + or = and enclose function arguments in parentheses. The following example uses `MLPutMatrix` to put the data in cell `C10` into matrix `A`:

```
=MLPutMatrix("A", C10)
```

For more information on specifying arguments in Spreadsheet Link EX functions, see "Working with Arguments in Spreadsheet Link EX Functions" on page 1-22.

Note Do not use the Excel Function Wizard. It can generate unpredictable results.

After a Spreadsheet Link EX function successfully executes as a worksheet formula, the cell contains the value `0`. While the function executes, the cell might continue to show the formula you entered.

To change the active cell when an operation completes, click **Excel Tools Options > Edit > Move Selection after Enter**. This action provides a useful confirmation for lengthy operations.

Automatic Calculation Mode Vs. Manual Calculation Mode

Spreadsheet Link EX functions are most effective in automatic calculation mode. To *automate* the recalculation of a Spreadsheet Link EX function, add to it a cell whose value changes. In the following example, the `MLPutMatrix` function reexecutes when the value in cell `C1` changes:

```
=MLPutMatrix("bonds", D1:G26) + C1
```

Note Be careful to avoid creating endless recalculation loops.

To use `MLGetMatrix` in manual calculation mode:

1. Enter the function into a cell.
2. Press **F2**.
3. Press **Enter**. The function executes.

Spreadsheet Link EX functions do not automatically adjust cell addresses. If you use explicit cell addresses in a function, you must edit the function arguments to reference a new cell address when you do either of the following:

- Insert or delete rows or columns.
- Move or copy the function to another cell.

Note Pressing **F9** to recalculate a worksheet affects only Excel functions. This key does not operate on Spreadsheet Link EX functions.

Working with Arguments in Spreadsheet Link EX Functions

This section describes tips for managing variable-name arguments and data-location arguments in Spreadsheet Link EX functions.

Variable-Name Arguments

- You can *directly* or *indirectly* specify a variable-name argument in most Spreadsheet Link EX functions:
  - To specify a variable name directly, enclose it in double quotation marks; for example, `MLDeleteMatrix("Bonds")`.
  - To specify a variable name as an indirect reference, enter it without quotation marks. The function evaluates the contents of the argument to get the variable name. The argument must be a worksheet cell address or range name; for example, `MLDeleteMatrix(C1)`.

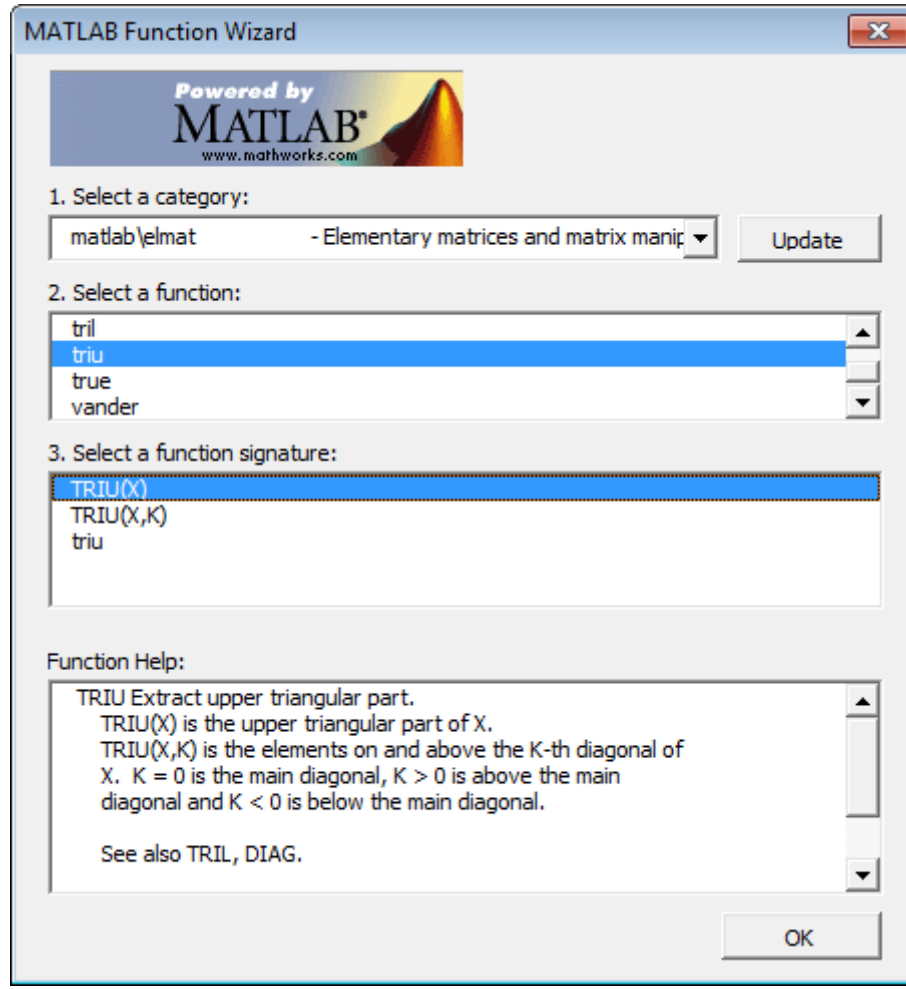
Data-Location Arguments

- A data-location argument must be a worksheet cell address or range name.
- Do not enclose a data-location argument in quotation marks (except in `MLGetMatrix`, which has unique argument conventions).
- A data-location argument can include a worksheet number; for example, `Sheet3!B1:C7` or `Sheet2!OUTPUT`.

Note You can reference special characters as part of a worksheet name in `MLGetMatrix` or `MLPutMatrix` by embedding the worksheet name within single quotation marks (`' '`).

Using the MATLAB Function Wizard for the Spreadsheet Link EX Software

The MATLAB Function Wizard for the Spreadsheet Link EX software allows you to browse MATLAB folders and run functions from within the Excel interface.



You can use this wizard to:

1. Display a list of all MATLAB working folders and function categories.

   All folders or categories in the current `MATLABPATH` display in the **Select a category** field. Click an entry in the list to select it. Each entry in the list displays as a folder path and a description read from the `Contents.m` file in that folder. If no `Contents.m` file is found, the folder or category display notifies you as follows:

   ```
   finance\finsupport -(No table of contents file)
   ```

   To refresh the folder/category list, click the **Update** button.

2. Select a particular folder or category, and list functions available for that folder or category.

   After you select a folder or category, the **Select a function** field displays available functions for that folder or category. Click a function name to select it.

   Tip The Function Wizard does not allow you to access MATLAB constructors and methods. You can write a wrapper function for a method or a constructor and access that wrapper. See "Using the Function Wizard to Access Custom MATLAB Functions" on page 1-27.

   ---

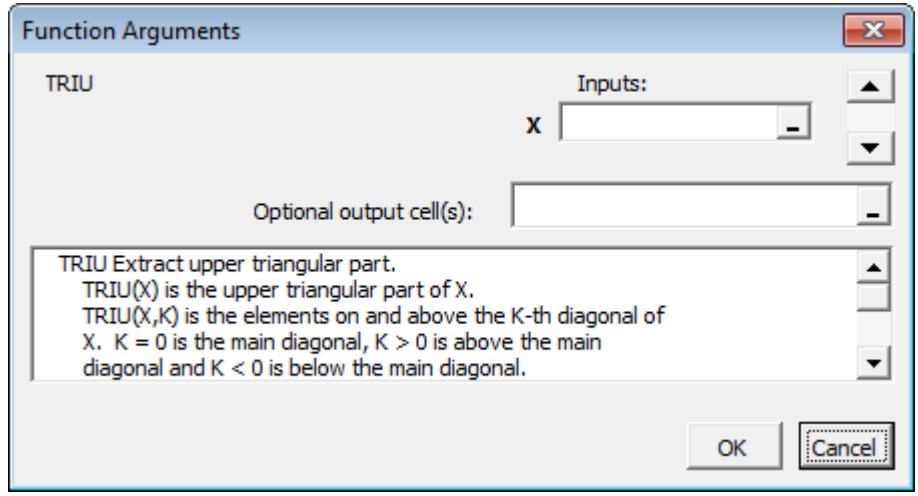
3. Select a function signature and enter a formula into the current spreadsheet cell.

   After you select a function, the **Select a function signature** field displays available signatures for that function. Click a function signature to select it.

4. View help for the selected function.

   The **Function Help** field displays help for the selected function.

When you click a function signature, the **Function Arguments** dialog box appears.



This dialog box allows you to specify the cells that contain input arguments and the cells where to display outputs. By default, the output of the selected function appears in the current spreadsheet cell using the Spreadsheet Link EX function `matlabfcn`. In the following example, the output displays in the current spreadsheet cell and generates a MATLAB figure:

```
=matlabfcn("plot",Sheet1!$B$2:$D$4)
```

Specifying a target range of cells using the **Optional output cell(s)** field in the Function Arguments dialog box causes the selected function to appear in the current spreadsheet cell as an argument of the `matlabsub` function. In addition, `matlabsub` includes an argument that indicates where to write the function's output. In the following example, the data from `A2` is input to the `rand` function, whose target cell is `B2`:

```
=matlabsub("rand","Sheet1!$B$2",Sheet1!$A$2)
```

Tip Although the Function Wizard lets you specify multiple output cells, it does not return multiple outputs. If you specify a range of output cells, the wizard returns the first output argument starting in the first output cell.

For example, if a function returns two separate elements `a` and `b`, and you specify `A1:A2` as output cells, the Function Wizard displays element `a` in cell `A1`. It discards element `b`. If an output is a matrix, the Function Wizard displays all elements of that matrix starting in the first output cell.

Using the Function Wizard to Access Custom MATLAB Functions

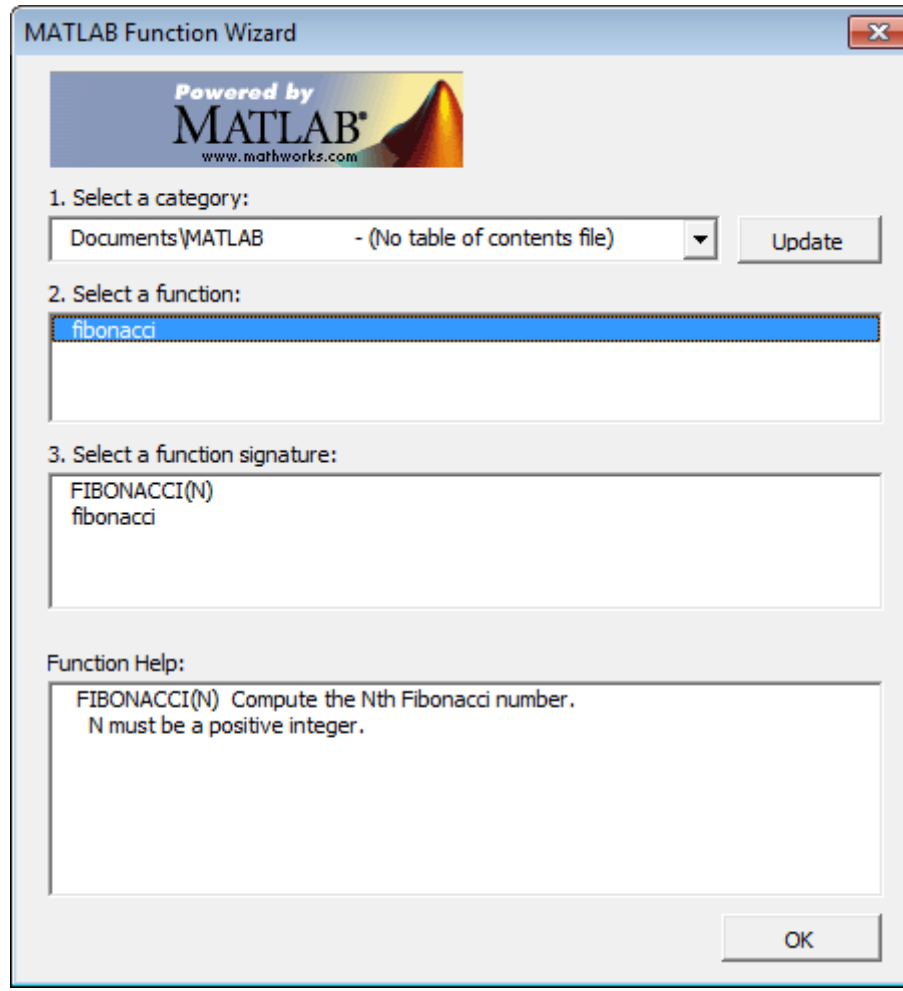
To access your custom MATLAB functions from the Function Wizard:

1. In MATLAB, create and save your function. For example, write the function that computes the Fibonacci numbers and save it in the folder `Documents\MATLAB`:

```
function f = fibonacci(n)
%FIBONACCI(N)  Compute the Nth Fibonacci number.
% N must be a positive integer.
if n < 0
    error('Invalid number.')
elseif n == 0
    f = 0;
elseif n == 1
    f = 1;
else
    f = fibonacci(n - 1) + fibonacci(n - 2);
end;
end
```

2. Add the folder where you saved the function to the MATLAB search path. To add the folder to the search path, use the `pathtool` function or select **File > Set Path** in the MATLAB desktop.

3. In Excel, open the MATLAB Function Wizard and select the folder where you saved your function.



The Function Wizard does not allow you to access MATLAB constructors and methods. To be able to access a method or a constructor from the Function Wizard, write a wrapper function for that method or constructor. For example, to access the `timeseries(DATA)` constructor from the Function Wizard, write the following wrapper function:

```
function TS = timeseries_wrapper(DATA)
% timeseries_wrapper(DATA) is a wrapper function
% for TIMESERIES(DATA)
%   TS = TIMESERIES(DATA) creates a time series object TS using
%   data DATA. By default, the time vector ranges from 0 to N-1,
%   where N is the number of samples, and has an interval of 1
%   second. The default name of the TS object is 'unnamed'.
T = timeseries(DATA);
TS = T.data;
end
```

Examples: Using Spreadsheet Link EX Functions in Macros

About the Examples

This section contains examples that show how to manipulate MATLAB data using Spreadsheet Link EX.

- For an example of how to exchange data between the MATLAB and Excel workspaces, see “Importing and Exporting Data Between the Microsoft® Excel® Interface and the MATLAB Workspace” on page 1-32.
- For an example of how to export data from the MATLAB workspace and display it in an Excel worksheet, see “Sending MATLAB Data to an Excel Worksheet and Displaying the Results” on page 1-29.

Sending MATLAB Data to an Excel Worksheet and Displaying the Results

In this example, you run MATLAB commands using VBA, send MATLAB data to the Excel software, and display the results in an Excel dialog box.

1. Start an Excel session.
2. Initialize the MATLAB session by clicking the **startmatlab** button in the Spreadsheet Link EX toolbar or by running the `matlabinit` function.
3. If the Spreadsheet Link EX Add-In is not enabled, enable it.

- For instructions on enabling this Add-In for the Excel 2003 software, see "Configuring Microsoft® Excel® 2003 and Earlier Versions" on page 1-8.
- For instructions on enabling this Add-In for the Excel 2007 software, see "Configuring Microsoft® Excel® 2007 and 2010" on page 1-9.

4 Enable the Spreadsheet Link EX software as a Reference in the Microsoft Visual Basic Editor. For instructions, see "Working with the Microsoft® Visual Basic® Editor" on page 1-13.

5 In the Visual Basic Editor, create a module.

a Right-click the **Microsoft Excel Objects** folder in the **Project — VBAProject** browser.

b Select **Insert > Module**.

6 Enter the following code into the module window:

```
Option Base 1
Sub Method1()

    MLShowMatlabErrors "yes"

    '''To MATLAB:
    Dim Vone(2, 2) As Double    'Input
    Vone(1, 1) = 1
    Vone(1, 2) = 2
    Vone(2, 1) = 3
    Vone(2, 2) = 4

    MLPutMatrix "a", Range("A1:B2")
    MLPutVar "b", Vone
    MLEvalString ("c = a*b")
    MLEvalString ("d = eig(c)")

    '''From MATLAB:
    Dim Vtwo As Variant         'Output
    MLGetVar "c", Vtwo
    MsgBox "c is " & Vtwo(1, 1)
```

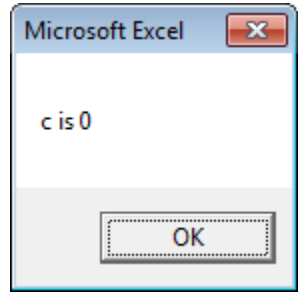
```
    MLGetMatrix "b", Range("A7:B8").Address
    MatlabRequest
    MLGetMatrix "c", "Sheet1!A4:B5"
    MatlabRequest

    Sheets("Sheet1").Select
    Range("A10").Select
    MLGetMatrix "d", ActiveCell.Address
    MatlabRequest

End Sub
```

Tip Copy and paste this code into the Visual Basic Editor from the HTML version of the documentation.

---

7 Run the code. Press **F5** or click **Run > Run Sub/UserForm**.

The following dialog box appears.



8 Click **OK** to close the dialog box.

Note Do not include `MatlabRequest` in a macro function unless the macro function is called from a subroutine.

Tip In macros, leave a space between the function name and the first argument; do not use parentheses.

Importing and Exporting Data Between the Microsoft Excel Interface and the MATLAB Workspace

- This example uses `MLGetMatrix` in a macro subroutine to export data from the MATLAB matrix `A` into the Excel worksheet `Sheet1`.

```
Sub Test1()
   MLGetMatrix "A", "Sheet1!A5"
   MatlabRequest
End Sub
```

Note The `MatlabRequest` function initializes internal Spreadsheet Link EX variables and enables `MLGetMatrix` to function in the subroutine.

- This example uses `MLPutMatrix` in a macro subroutine to import data into the MATLAB matrix `A`, from a specified cell range in the Excel worksheet `Sheet1`.

```
Sub Test2()
  Set myRange = Range("A1:C3")
  MLPutMatrix "A", myRange
End Sub
```

Working with Dates

Default Microsoft Excel date numbers represent the number of days that have passed since January 1, 1900. For example, January 1, 1950 is represented as 18264 in the Excel software.

However, MATLAB date numbers represent the number of days that have passed since January 1, 0000, so January 1, 1950 is represented as 712224 in the MATLAB software. Therefore, the difference in dates between the Excel software and the MATLAB software is a constant, 693960 (712224 minus 18264).

To use date numbers in MATLAB calculations, apply the 693960 constant as follows:

- Add it to Excel date numbers that are read into the MATLAB software.
- Subtract it from MATLAB date numbers that are read into the Excel software.

Note If you use the optional Excel 1904 date system, the constant is 695422.

Dates are stored internally in the Excel software as numbers and are unaffected by locale.

Localization Information

This document uses the Microsoft Excel software with an `English (United States)` Microsoft Windows regional setting for illustrative purposes. If you use the Spreadsheet Link EX software with a non-`English (United States)` Windows desktop environment, certain syntactical elements may not work as illustrated. For example, you may have to replace the comma (`,`) delimiter within Spreadsheet Link EX commands with a semicolon (`;`) or other operator.

Please consult your Windows documentation to determine which regional setting differences exist among non-U.S. versions.

2

Solving Problems with the Spreadsheet Link EX Software

Modeling Data Sets Using Data Regression and Curve Fitting

In this section...

Regression techniques and curve fitting attempt to find functions that describe the relationship among variables. In effect, they attempt to build mathematical models of a data set. MATLAB matrix operators and functions simplify this task.

This example shows both data regression and curve fitting. It also executes the same example in a worksheet version and a macro version. The example uses Microsoft Excel worksheets to organize and display the data. Spreadsheet Link EX functions copy the data to the MATLAB workspace, and then executes MATLAB computational and graphic functions. The macro version also returns output data to an Excel worksheet.

This example is included in the Spreadsheet Link EX product. To run it:

1. Start Excel, Spreadsheet Link EX, and MATLAB sessions.
2. Navigate to the folder *`matlabroot`*`\toolbox\exlink\`.
3. Open the file `ExliSamp.xls`
4. Execute the example as needed.

Using Worksheets

1. Click the **Sheet1** tab on the `ExliSamp.xls` window. The worksheet for this example appears.

	A	B	C	D	E	F	G	H	I	J	K	L
1	**Regression and Curve Fitting**											
2												
3		**DATA**			**Spreadsheet Link EX Functions**							
4	35	207	1325		1. Transfer the data to MATLAB.							
5	17	90	533		#MATLAB? <== MLPutMatrix("data",DATA)							
6	43	180	1013									
7	41	187	1163		2. Set up data for regression.							
8	177	552	5326		#MATLAB? <== MLEvalString("y = data(:,3)")							
9	57	354	2043		#MATLAB? <== MLEvalString("e = ones(length(data),1)")							
10	20	101	602		#MATLAB? <== MLEvalString("A = [e data(:,1:2)]")							
11	18	91	532									
12	17	86	543		3. Compute regression coefficients.							
13	35	180	1134		#MATLAB? <== MLEvalString("beta = A\y")							
14	25	136	766									
15	17	84	495		4. Calculate regressed result.							
16	23	102	635		#MATLAB? <== MLEvalString("fit = A*beta")							
17	24	148	913									
18	40	292	1591		5. Compare original data with regression results.							
19	25	126	671		#MATLAB? <== MLEvalString("[y,k] = sort(y)")							
20	17	88	521		#MATLAB? <== MLEvalString("fit = fit(k)")							
21	46	235	1319		#MATLAB? <== MLEvalString("n = size(data,1)")							
22	37	204	1038									
23	15	68	458		6. Use MATLAB's polynomial solving functions for another curve fit.							
24	85	363	2904		#MATLAB? <== MLEvalString("[p,S] = polyfit(1:n,y',5)")							
25	66	300	2006		#MATLAB? <== MLEvalString("newfit = polyval(p,1:n,S)")							
26	39	161	938									
27	111	459	3282		7. Plot curves and add legend							
28	16	80	476		#MATLAB? <== MLEvalString("plot(1:n,y,'bo',1:n,fit,'r:',1:n,newfit,'g'); legend('data','fit','newfit')")							

The worksheet contains one named range: `A4:C28` is named `DATA` and contains the data set for this example.

2 Make `E5` the active cell. Press **F2**; then press **Enter** to execute the Spreadsheet Link EX function that copies the sample data set to the MATLAB workspace. The data set contains 25 observations of three variables. There is a strong linear dependence among the observations; in fact, they are close to being scalar multiples of each other.

3 Move to cell `E8` and press **F2**; then press **Enter**. Repeat with cells `E9` and `E10`. These Spreadsheet Link EX functions regress the third column of data on the other two columns, and create the following:

- A single vector `y` containing the third-column data.
- A three-column matrix `A`, that consists of a column of ones followed by the rest of the data.

4. Execute the function in cell `E13`. This function computes the regression coefficients by using the MATLAB back slash (`\`) operation to solve the (overdetermined) system of linear equations, `A*beta = y`.

5. Execute the function in cell `E16`. MATLAB matrix-vector multiplication produces the regressed result (`fit`).

6. Execute the functions in cells `E19`, `E20`, and `E21`. These functions do the following:

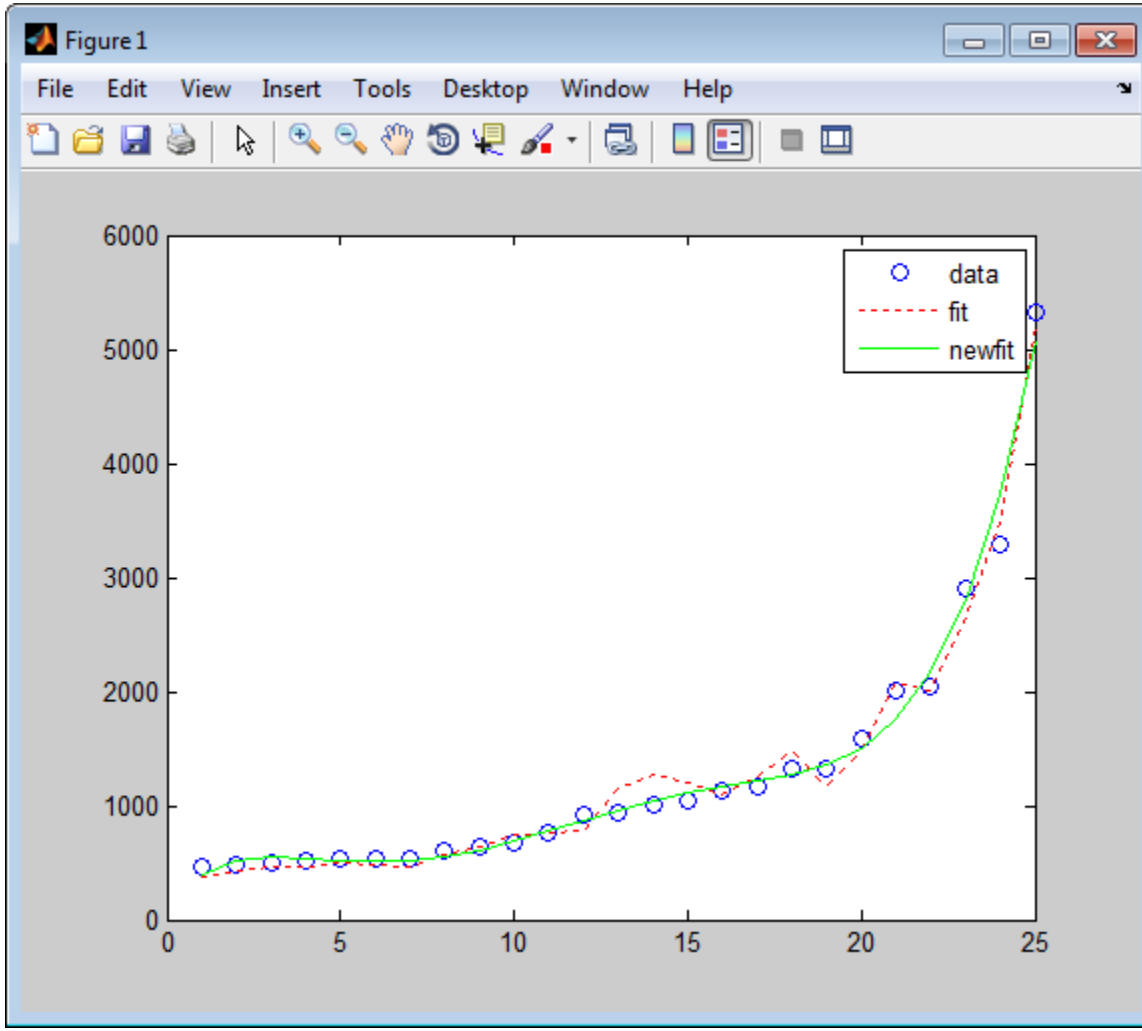
   a. Compare the original data with `fit`.

   b. Sort the data in increasing order and apply the same permutation to `fit`.

   c. Create a scalar for the number of observations.

7. Execute the functions in cells `E24` and `E25`. Often it is useful to fit a polynomial equation to data. To do so, you would ordinarily have to set up a system of simultaneous linear equations and solve for the coefficients. The MATLAB `polyfit` function automates this procedure, in this case for a fifth-degree polynomial. The `polyval` function then evaluates the resulting polynomial at each data point to check the goodness of fit (`newfit`).

8. Execute the function in cell `E28`. The MATLAB `plot` function graphs the original data (blue circles), the regressed result `fit` (dashed red line), and the polynomial result (solid green line). It also adds a legend.

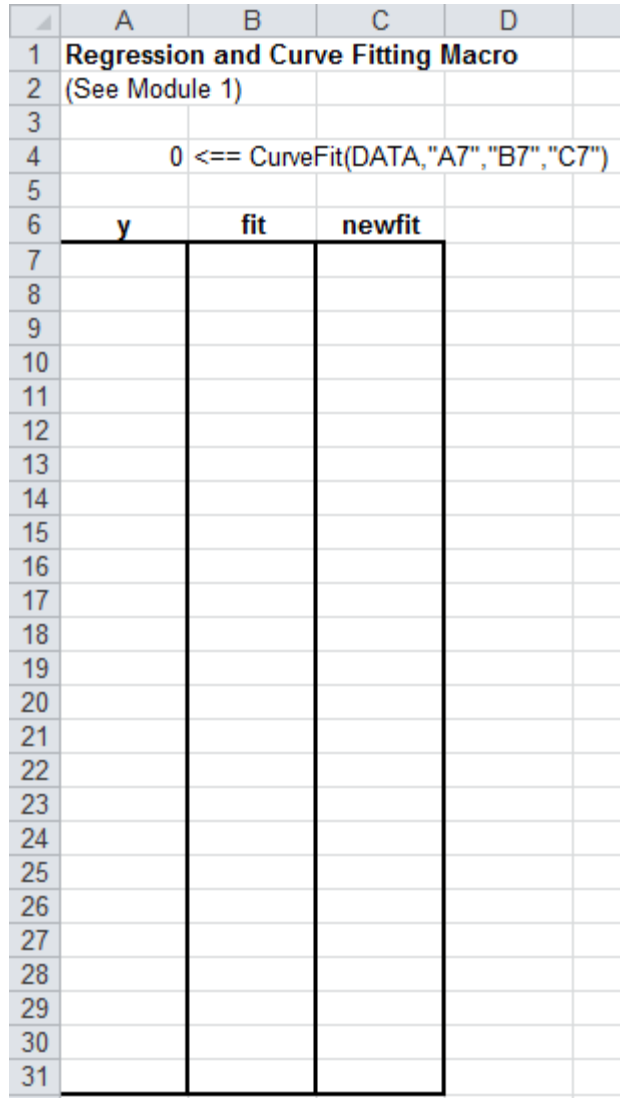


Since the data is closely correlated but not exactly linearly dependent, the `fit` curve (dashed line) shows a close, but not an exact, fit. The fifth-degree polynomial curve, `newfit`, is a more accurate mathematical model for the data.

When you finish this version of the example, close the figure window.

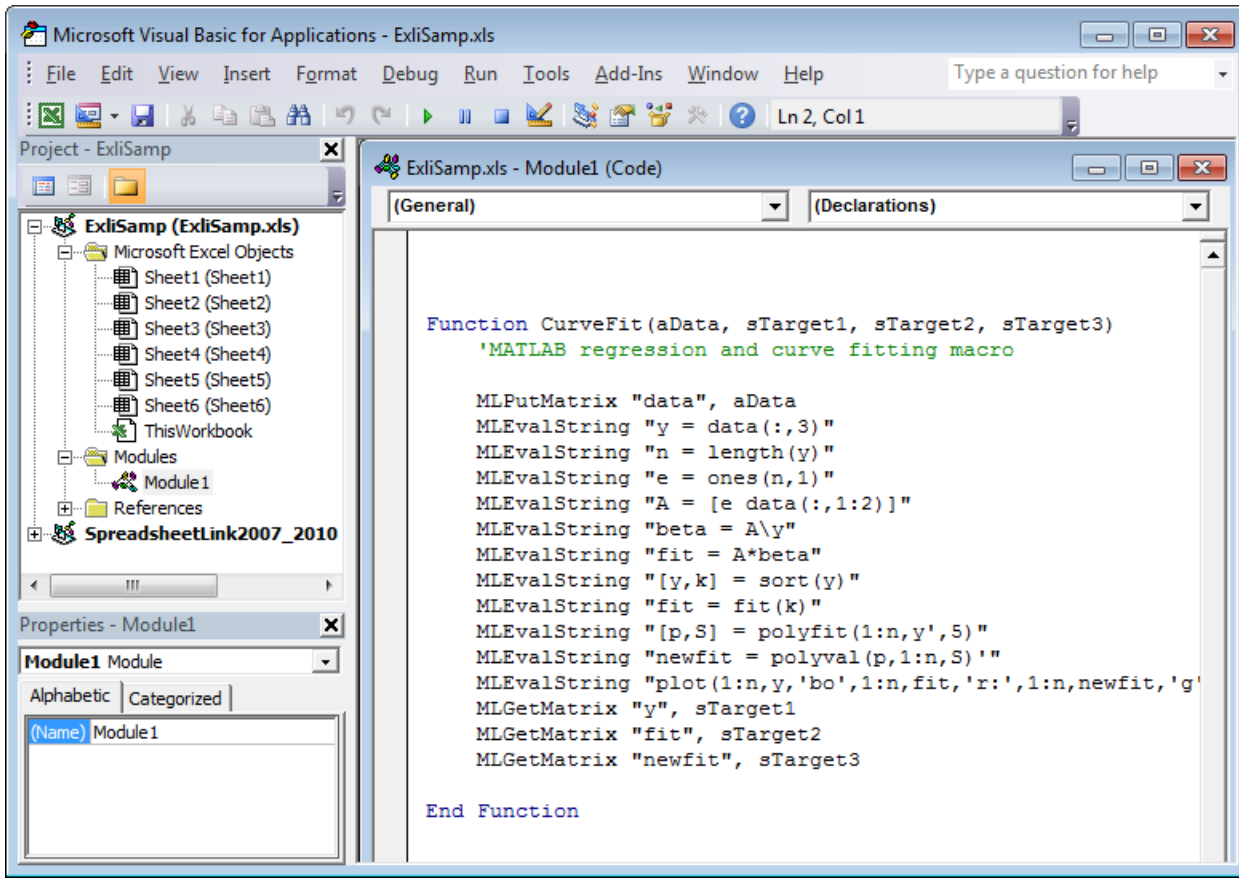
Using Macros

1 Click the **Sheet2** tab on `ExliSamp.xls`. The worksheet for this example appears.



2 Make cell `A4` the active cell, but do not execute it yet.

Cell `A4` calls the macro `CurveFit`, which you can examine in the Microsoft Visual Basic environment.



3 While this module is open, make sure that the Spreadsheet Link EX add-in is enabled.

- If you are using the Excel 2003 software:

  a Click **Tools > References**.

b In the References dialog box, make sure that the `excllink.xla` check box is selected. If not, select it.

c Click **OK**.

- If you are using the Excel 2007 software:

d Click the Microsoft Office Button,  .

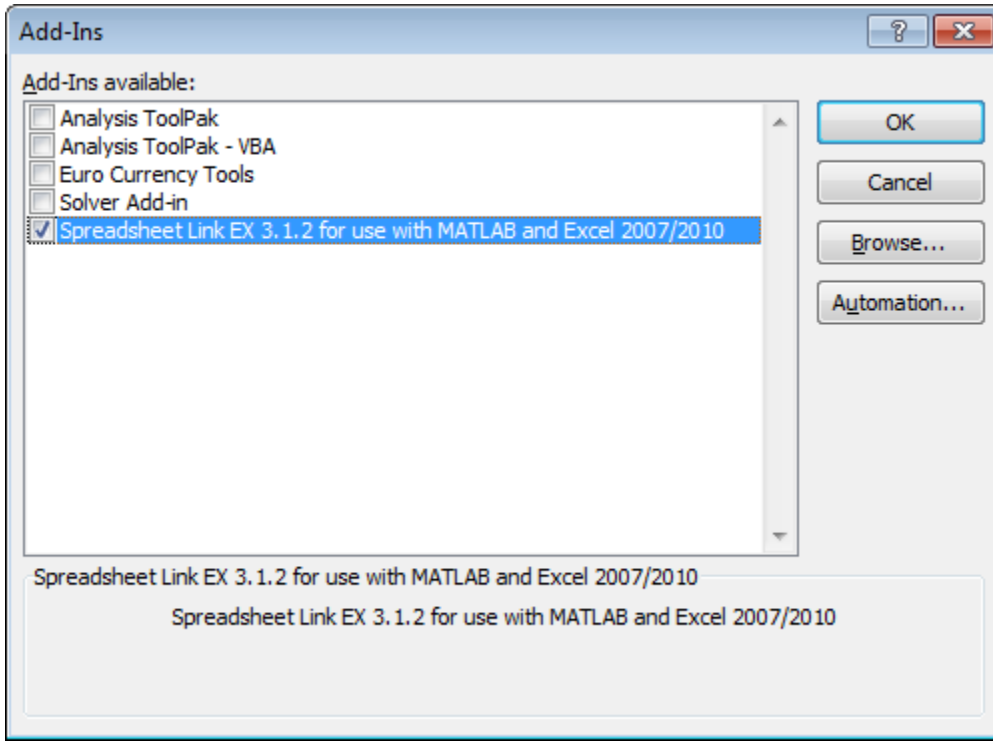
e Click **Options**. The Excel Options pane appears.

f Click **Add-Ins**.

g From the Manage selection list, choose **Excel Add-Ins**.

h Click **Go**. The Add-Ins pane appears.

i Make sure that the **Spreadsheet Link EX for use with MATLAB** check box is selected. If not, select it.



j Click **OK** to close the Add-Ins pane.

k Click **OK** to close the Excel Options pane.

4 In cell `A4` of **Sheet2**, press **F2**; then press **Enter** to execute the `CurveFit` macro. The macro does the following:

a Runs the same functions as the worksheet example (in a slightly different order), including plotting the graph.

b Calls the `MLGetMatrix` function in the `CurveFit` macro. This macro copies to the worksheet the original data `y` (sorted), the corresponding regressed data `fit`, and the polynomial data `newfit`.

	A	B	C	D
1	**Regression and Curve Fitting Macro**			
2	(See Module 1)			
3				
4	0	<== CurveFit(DATA,"A7","B7","C7")		
5				
6	**y**	**fit**	**newfit**	
7	1325	379.0475	402.008	
8	533	430.3099	515.8528	
9	1013	462.4722	549.7114	
10	1163	472.0222	543.0184	
11	5326	501.7971	524.5499	
12	2043	476.7973	513.775	
13	602	467.2472	522.2081	
14	532	570.8968	554.761	
15	543	641.1212	611.0947	
16	1134	743.6461	686.9715	
17	766	767.5211	775.6072	
18	495	773.5589	869.023	
19	635	1143.781	959.3974	
20	913	1279.593	1040.419	
21	1591	1201.219	1108.636	
22	671	1098.695	1164.812	
23	521	1251.081	1215.276	
24	1319	1478.743	1273.275	
25	1038	1163.157	1360.322	
26	458	1479.157	1507.557	
27	2904	2086.177	1757.09	
28	2006	2011.592	2163.358	
29	938	2666.224	2794.475	
30	3282	3483.345	3733.586	
31	476	5197.796	5080.215	

Interpolating Data

Interpolation is a process for estimating values that lie between known data points. It is important for applications such as signal and image processing and data visualization. MATLAB interpolation functions let you balance the smoothness of data fit with execution speed and efficient memory use.

This example is included in the Spreadsheet Link EX product. To run it:

1. Start Excel, Spreadsheet Link EX, and MATLAB sessions.
2. Navigate to the folder *`matlabroot`*`\toolbox\exlink\`.
3. Open the file `ExliSamp.xls`
4. Execute the example as needed.

This example uses a two-dimensional data-gridding interpolation function on thermodynamic data, where volume has been measured for time and temperature values. It finds the volume values underlying the two-dimensional, time-temperature function for a new set of time and temperature coordinates.

The example uses a Microsoft Excel worksheet to organize and display the original data and the interpolated output data. You use Spreadsheet Link EX functions to copy the data to and from the MATLAB workspace, and then execute the MATLAB interpolation function. Finally, you invoke MATLAB graphics to display the interpolated data in a three-dimensional color surface.

1. Click the **Sheet3** tab on `ExliSamp.xls`. The worksheet for this example appears.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
1	**Data Interpolation**																			
2																				
3	**Original Data**					**Interpolated Values**														
4	**Time**	**Temp**	**Volume**																	
5	0.025	68.00	2504.08			**Temp**														
6	0.050	68.05	2535.07		**Time**	68.0	68.5	69.0	69.5	70.0	70.5	71.0	71.5	72.0	72.5	73.0	73.5	74.0	74.5	75.0
7	0.075	68.07	2562.91		0.025															
8	0.100	68.09	2575.74		0.05															
9	0.125	68.20	2606.16		0.075															
10	0.150	68.50	2628.58		0.1															
11	0.175	68.85	2681.38		0.125															
12	0.200	69.22	2712.06		0.15															
13	0.225	70.08	2767.52		0.175															
14	0.250	70.33	2815.54		0.2															
15	0.275	70.59	2824.37		0.225															
16	0.300	70.85	2873.65		0.25															
17	0.325	71.11	2882.20		0.275															
18	0.350	71.44	2896.49		0.3															
19	0.375	71.82	2902.07		0.325															
20	0.400	72.33	2920.04		0.35															
21	0.425	72.65	2929.35		0.375															
22	0.450	73.46	2934.23		0.4															
23	0.475	73.85	2938.55		0.425															
24	0.500	74.22	3012.93		0.45															
25	0.525	74.37	3099.12		0.475															
26	0.550	74.55	3130.01		0.5															
27	0.575	74.67	3179.24		0.525															
28	0.600	74.72	3180.71		0.55															
29	0.625	75.00	3184.15		0.575															
30					0.6															
31	**Spreadsheet Link EX Functions**																			
32	1. Transfer original data to MATLAB.																			
33	#MATLAB <== MLPutMatrix("Labels", A4:C4)																			
34	#MATLAB <== MLPutMatrix("X",A5:A29)																			
35	#MATLAB <== MLPutMatrix("T",B5:B29)																			
36	#MATLAB <== MLPutMatrix("V",C5:C29)																			
37																				
38	2. Transfer interpolation data points to MATLAB.																			
39	#MATLAB <== MLPutMatrix("Xa",E7:E30)																			
40	#MATLAB <== MLPutMatrix("Ta",F6:T6)																			
41																				
42	3. Execute MATLAB data interpolation function.																			
43	#MATLAB <== MLEvalString("[Xl, Tl, Vl] = griddata(X,T,V,Xa,Ta, 'invdist')")																			
44																				
45	4. Transpose output data matrix and transfer data to Excel.																			
46	#MATLAB <== MLEvalString("Vl = Vl';")																			
47	#MATLAB <== MLGetMatrix("Vl","sheet3!F7")																			
48																				
49	5. Plot interpolated data and label the figure.																			
50	#MATLAB <== MLEvalString("surf(Xl, Tl, Vl);title('Interpolated Data');xlabel(Labels{1});ylabel(Labels{2});zlabel(Labels{3});grid on")																			

The worksheet contains the measured thermodynamic data in cells `A5:A29`, `B5:B29`, and `C5:C29`. The time and temperature values for interpolation are in cells `E7:E30` and `F6:T6`, respectively.

2 Make `A33` the active cell. Press **F2**; then press **Enter** to execute the Spreadsheet Link EX function that passes the `Time`, `Temp`, and `Volume` labels to the MATLAB workspace.

3 Make `A34` the active cell. Press **F2**; then press **Enter** to execute the Spreadsheet Link EX function that copies the original time data to the MATLAB workspace. Move to cell `A35` and execute the function to copy the

original temperature data. Execute the function in cell `A36` to copy the original volume data.

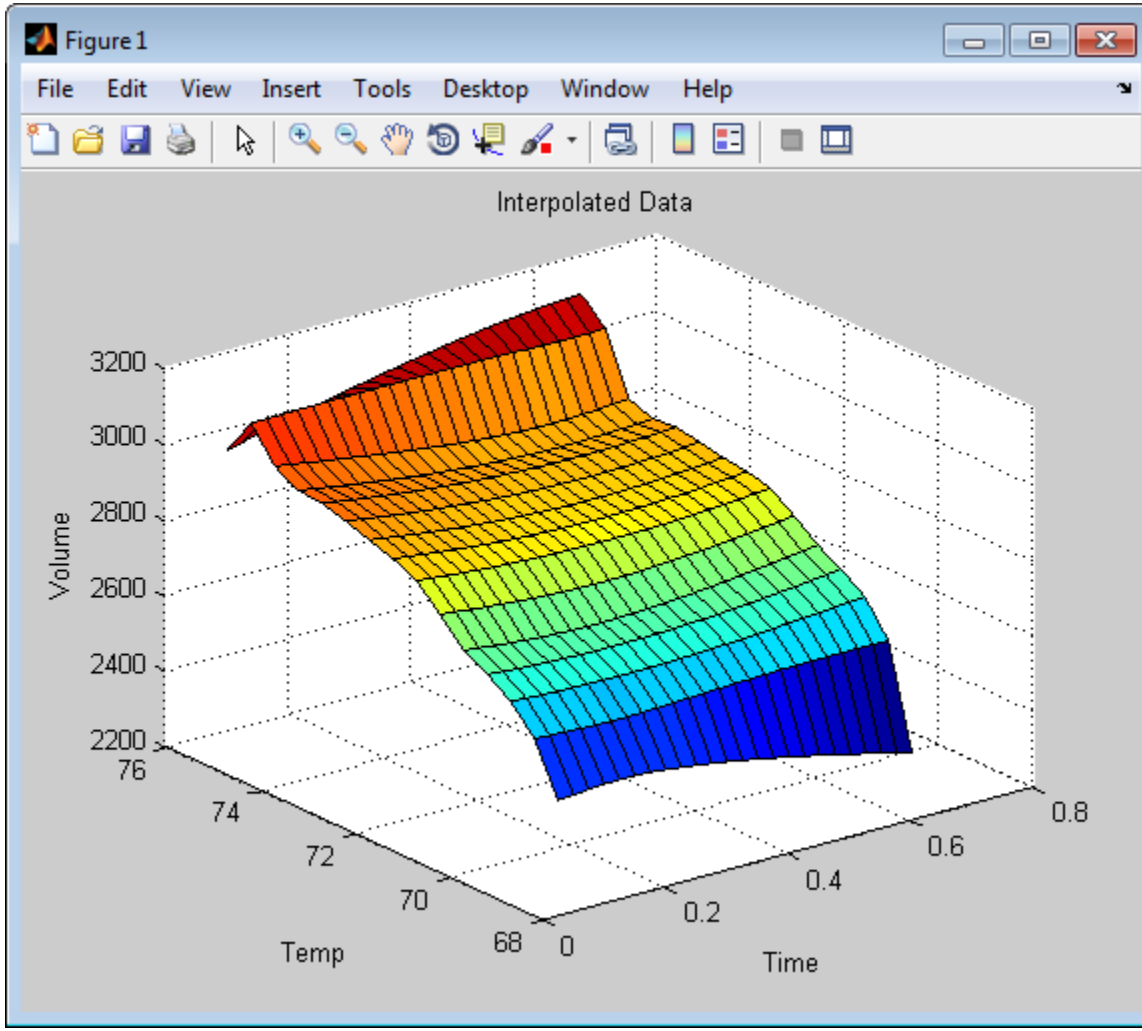
4. Move to cell `A39` and press **F2**; then press **Enter** to copy the interpolation time values to the MATLAB workspace. Execute the function in cell `A40` to copy the interpolation temperature values.

5. Execute the function in cell `A43`. `griddata` is the MATLAB two-dimensional interpolation function that generates the interpolated volume data using the inverse distance method.

6. Execute the functions in cells `A46` and `A47` to transpose the interpolated volume data and copy it to the Excel worksheet. The data fills cells `F7:T30`, which are enclosed in a border.

	Interpolated Values														
	Temp														
Time	68.0	68.5	69.0	69.5	70.0	70.5	71.0	71.5	72.0	72.5	73.0	73.5	74.0	74.5	75.0
0.025	2504.08	2638.15	2707.32	2750.09	2784.91	2851.19	2911.62	2940.67	2961.40	2983.17	3000.06	3006.32	3041.01	3125.78	3026.85
0.05	2507.26	2635.76	2704.79	2746.66	2779.96	2846.35	2907.00	2934.98	2955.07	2976.69	2993.64	2999.35	3034.49	3126.43	3036.68
0.075	2510.83	2633.45	2702.58	2743.62	2775.40	2841.84	2902.75	2929.64	2949.08	2970.51	2987.50	2992.60	3027.98	3126.97	3046.32
0.1	2513.93	2631.34	2700.70	2740.99	2771.27	2837.66	2898.88	2924.66	2943.43	2964.66	2981.67	2986.08	3021.49	3127.39	3055.77
0.125	2515.14	2629.60	2699.17	2738.77	2767.61	2833.83	2895.40	2920.07	2938.14	2959.14	2976.16	2979.83	3015.06	3127.71	3065.02
0.15	2514.31	2628.58	2698.02	2736.99	2764.49	2830.38	2892.31	2915.87	2933.23	2953.97	2970.99	2973.86	3008.70	3127.95	3074.08
0.175	2511.84	2628.88	2697.25	2735.66	2762.00	2827.31	2889.59	2912.08	2928.72	2949.17	2966.17	2968.21	3002.47	3128.11	3082.93
0.2	2508.10	2629.91	2696.87	2734.79	2760.22	2824.68	2887.26	2908.72	2924.62	2944.75	2961.71	2962.89	2996.39	3128.21	3091.57
0.225	2503.37	2631.32	2696.88	2734.37	2759.24	2822.57	2885.29	2905.80	2920.96	2940.73	2957.65	2957.93	2990.50	3128.25	3099.99
0.25	2497.84	2632.93	2697.28	2734.42	2759.10	2821.05	2883.68	2903.34	2917.76	2937.13	2953.97	2953.36	2984.86	3128.24	3108.19
0.275	2491.66	2634.64	2698.05	2734.91	2759.76	2820.23	2882.43	2901.33	2915.02	2933.97	2950.71	2949.20	2979.52	3128.18	3116.14
0.3	2484.92	2636.35	2699.18	2735.85	2761.12	2820.16	2881.55	2899.79	2912.78	2931.26	2947.88	2945.48	2974.53	3128.07	3123.83
0.325	2477.71	2638.00	2700.64	2737.22	2763.09	2820.81	2881.06	2898.72	2911.04	2929.03	2945.47	2942.21	2969.96	3127.90	3131.26
0.35	2470.07	2639.54	2702.41	2739.01	2765.59	2822.11	2880.97	2898.13	2909.82	2927.29	2943.52	2939.43	2965.89	3127.66	3138.38
0.375	2462.06	2640.93	2704.45	2741.19	2768.54	2823.98	2881.29	2898.00	2909.13	2926.05	2942.01	2937.16	2962.39	3127.30	3145.19
0.4	2453.70	2642.15	2706.75	2743.75	2771.89	2826.33	2882.03	2898.34	2908.97	2925.33	2940.96	2935.42	2959.55	3126.79	3151.66
0.425	2445.03	2643.15	2709.26	2746.67	2775.62	2829.13	2883.20	2899.16	2909.34	2925.14	2940.37	2934.25	2957.45	3126.07	3157.75
0.45	2436.07	2643.94	2711.97	2749.92	2779.68	2832.32	2884.78	2900.44	2910.23	2925.48	2940.24	2933.67	2956.16	3125.09	3163.42
0.475	2426.82	2644.48	2714.84	2753.48	2784.06	2835.88	2886.78	2902.19	2911.63	2926.34	2940.57	2933.71	2955.74	3123.85	3168.63
0.5	2417.31	2644.77	2717.84	2757.32	2788.73	2839.78	2889.19	2904.40	2913.52	2927.71	2941.36	2934.34	2956.22	3122.46	3173.31
0.525	2407.54	2644.80	2720.95	2761.44	2793.67	2844.01	2891.99	2907.04	2915.89	2929.57	2942.61	2935.55	2957.60	3121.27	3177.39
0.55	2397.51	2644.56	2724.14	2765.79	2798.87	2848.55	2895.19	2910.11	2918.72	2931.90	2944.30	2937.30	2959.85	3120.88	3180.74
0.575	2387.24	2644.05	2727.39	2770.37	2804.31	2853.38	2898.77	2913.60	2921.99	2934.68	2946.43	2939.57	2962.89	3121.69	3183.21
0.6	2376.71	2643.25	2730.67	2775.14	2809.97	2858.49	2902.71	2917.48	2925.67	2937.89	2948.99	2942.35	2966.66	3123.41	3184.53

7. Execute the function in cell `A50`. The MATLAB software plots and labels the interpolated data on a three-dimensional color surface, with the color proportional to the interpolated volume data.



When you finish the example, close the figure window.

Pricing Stock Options Using the Binomial Model

The Financial Toolbox™ product provides functions that compute prices, sensitivities, and profits for portfolios of options or other equity derivatives. This example uses the binomial model to price an option. The binomial model assumes that the probability of each possible price over time follows a binomial distribution. That is, prices can move to only two values, one up or one down, over any short time period. Plotting these two values over time is known as building a *binomial tree*.

This example organizes and displays input and output data using a Microsoft Excel worksheet. Spreadsheet Link EX functions copy data to a MATLAB matrix, calculate the prices, and return data to the worksheet.

This example is included in the Spreadsheet Link EX product. To run it:

1. Start Excel, Spreadsheet Link EX, and MATLAB sessions.
2. Navigate to the folder *`matlabroot`*`\toolbox\exlink\`.
3. Open the file `ExliSamp.xls`
4. Execute the example as needed.

Note This example requires Financial Toolbox, Statistics Toolbox™, and Optimization Toolbox™.

---

1. Click the **Sheet4** tab on `ExliSamp.xls` to open the worksheet for this example.

	A	B	C	D	E	F	G	H	I	J	K
1	**Binomial Option Pricing**										
2											
3		**bindata**		**Spreadsheet Link EX Functions**							
4	Asset price, so	$ 52.00		1. Transfer data to MATLAB.							
5	Option exercise price, x	$ 50.00		#MATLAB' <== MLPutMatrix("b", bindata)							
6	Risk-free interest rate, r	10%									
7	Time to maturity, t (yrs)	0.416667	=5/12	2. Execute MATLAB Financial Toolbox binomial option pricing function.							
8	Time increment, dt	0.083333	=1/12	#MATLAB' <== MLEvalString("[p, o]=binprice(b(1), b(2), b(3), b(4), b(5), b(6), b(7))")							
9	Volatility, sig	0.4									
10	Call (1) or put (0), flag	0		3. Transfer output data to Excel.							
11				#MATLAB' <== MLGetMatrix("p", "asset_tree")							
12				#MATLAB' <== MLGetMatrix("o", "value_tree")							
13											
14		Start	Period 1	Period 2	Period 3	Period 4	Period 5				
15	**Asset price tree, p ($)**										
16											
17											
18											
19											
20											
21											
22											
23	**Option value tree, o ($)**										
24											
25											
26											
27											
28											

The worksheet contains three named ranges:

- `B4:B10` named `bindata`. Two cells in `bindata` contain formulas:
  - `B7` contains `=5/12`
  - `B8` contains `=1/12`
- `B15` named `asset_tree`.
- `B23` named `value_tree`.

2 Make `D5` the active cell. Press **F2**; then press **Enter** to execute the Spreadsheet Link EX function that copies the asset data to the MATLAB workspace.

3 Move to `D8` and execute the function that computes the binomial prices.

4 Execute the functions in `D11` and `D12` to copy the price data to the Excel worksheet.

The worksheet looks as follows.

	A	B	C	D	E	F	G	H	I	J	K
1	**Binomial Option Pricing**										
2											
3		**bindata**		**Spreadsheet Link EX Functions**							
4	Asset price, so	$ 52.00		1. Transfer data to MATLAB.							
5	Option exercise price, x	$ 50.00		0 <== MLPutMatrix("b", bindata)							
6	Risk-free interest rate, r	10%									
7	Time to maturity, t (yrs)	0.416667	=5/12	2. Execute MATLAB Financial Toolbox binomial option pricing function.							
8	Time increment, dt	0.083333	=1/12	0 <== MLEvalString("[p, o]=binprice(b(1), b(2), b(3), b(4), b(5), b(6), b(7))")							
9	Volatility, sig	0.4									
10	Call (1) or put (0), flag	0		3. Transfer output data to Excel.							
11				0 <== MLGetMatrix("p", "asset_tree")							
12				0 <== MLGetMatrix("o", "value_tree")							
13											
14		Start	Period 1	Period 2	Period 3	Period 4	Period 5				
15	**Asset price tree, p ($)**	52.000	58.365	65.509	73.527	82.527	92.628				
16		0	46.329	52.000	58.365	65.509	73.527				
17		0	0	41.277	46.329	52.000	58.365				
18		0	0	0	36.776	41.277	46.329				
19		0	0	0	0	32.765	36.776				
20		0	0	0	0	0	29.192				
21											
22											
23	**Option value tree, o ($)**	3.728	1.664	0.428	0	0	0				
24		0	5.918	2.964	0.876	0	0				
25		0	0	9.060	5.164	1.793	0				
26		0	0	0	13.224	8.723	3.671				
27		0	0	0	0	17.235	13.224				
28		0	0	0	0	0	20.808				

Read the asset price tree as follows:

- Period 1 shows the up and down prices.
- Period 2 shows the up-up, up-down, and down-down prices.
- Period 3 shows the up-up-up, up-up, down-down, and down-down-down prices.
- And so on.

Ignore the zeros. The option value tree gives the associated option value for each node in the price tree. The option value is zero for prices significantly above the exercise price. Ignore the zeros that correspond to a zero in the price tree.

5 Try changing the data in `B4:B10`, and then executing the Spreadsheet Link EX functions again.

Note If you increase the time to maturity (`B7`) or change the time increment (`B8`), you may need to enlarge the output tree areas.

---

6 When you finish the example, close the figure window.

Calculating and Plotting the Efficient Frontier of Financial Portfolios

MATLAB and Financial Toolbox functions compute and plot risks, variances, rates of return, and the efficient frontier of portfolios. Efficient portfolios have the lowest aggregate variance, or risk, for a given return.Microsoft Excel and the Spreadsheet Link EX software let you set up data, execute financial functions and MATLAB graphics, and display numeric results.

This example analyzes three portfolios, using rates of return for six time periods. In actual practice, these functions can analyze many portfolios over many time periods, limited only by the amount of computer memory available.

This example is included in the Spreadsheet Link EX product. To run it:

1. Start Excel, Spreadsheet Link EX, and MATLAB sessions.
2. Navigate to the folder *`matlabroot`*`\toolbox\exlink\`.
3. Open the file `ExliSamp.xls`
4. Execute the example as needed.

Note This example requires Financial Toolbox, Statistics Toolbox, and Optimization Toolbox.

---

1. Click the **Sheet5** tab on `ExliSamp.xls`. The worksheet for this example appears.

	A	B	C	D	E	F	G	H	I	J
1	**Portfolio Efficient Frontier**									
2								Global	Corp. Bnd	Small Cap
3	**Rates of return**	Global	Corp. Bnd	Small Cap		**Risk**	**ROR**	**Weights**		
4	Nov-91	7.125%	4.125%	8.375%						
5	Nov-92	5.125%	5.125%	3.875%						
6	Nov-93	-1.375%	5.750%	10.500%						
7	Nov-94	7.750%	6.000%	14.750%						
8	Nov-95	8.250%	6.375%	-3.625%						
9	Nov-96	12.625%	6.125%	9.125%						
10										
11										
12										
13	**Spreadsheet Link EX Functions**									
14	1. Transfer data to MATLAB.									
15	#MATLAB?	<== MLPutMatrix("Labels", F3:G3)								
16	#MATLAB?	<== MLPutMatrix("retseries", B4:D9)								
17										
18	2. Execute MATLAB Financial Toolbox functions.									
19	#MATLAB?	<== MLEvalString("[ret, cov] = ewstats(retseries)")								
20	#MATLAB?	<== MLEvalString("[risk, ror, weights] = portopt(ret, cov, 20)")								
21										
22	3. Transfer output data to Excel.									
23	#MATLAB?	<== MLGetMatrix("risk", "sheet5!F4")								
24	#MATLAB?	<== MLGetMatrix("ror", "sheet5!G4")								
25	#MATLAB?	<== MLGetMatrix("weights", "sheet5!H4")								
26										
27	4. Plot efficient frontier data and label the figure.									
28	#MATLAB?	<== MLEvalString("portopt(ret, cov, 20); grid on; xlabel(Labels{1}); ylabel(Labels{2})")								

2 Make A15 the active cell. Press **F2**; then press **Enter**. The Spreadsheet Link EX function transfers the labels that describe the output that the MATLAB software computes.

3 Make A16 the active cell to copy the portfolio return data to the MATLAB workspace.

4 Execute the functions in A19 and A20 to compute the Financial Toolbox efficient frontier function for 20 points along the frontier.

5 Execute the Spreadsheet Link EX functions in A23, A24, and A25 to copy the output data to the Excel worksheet.

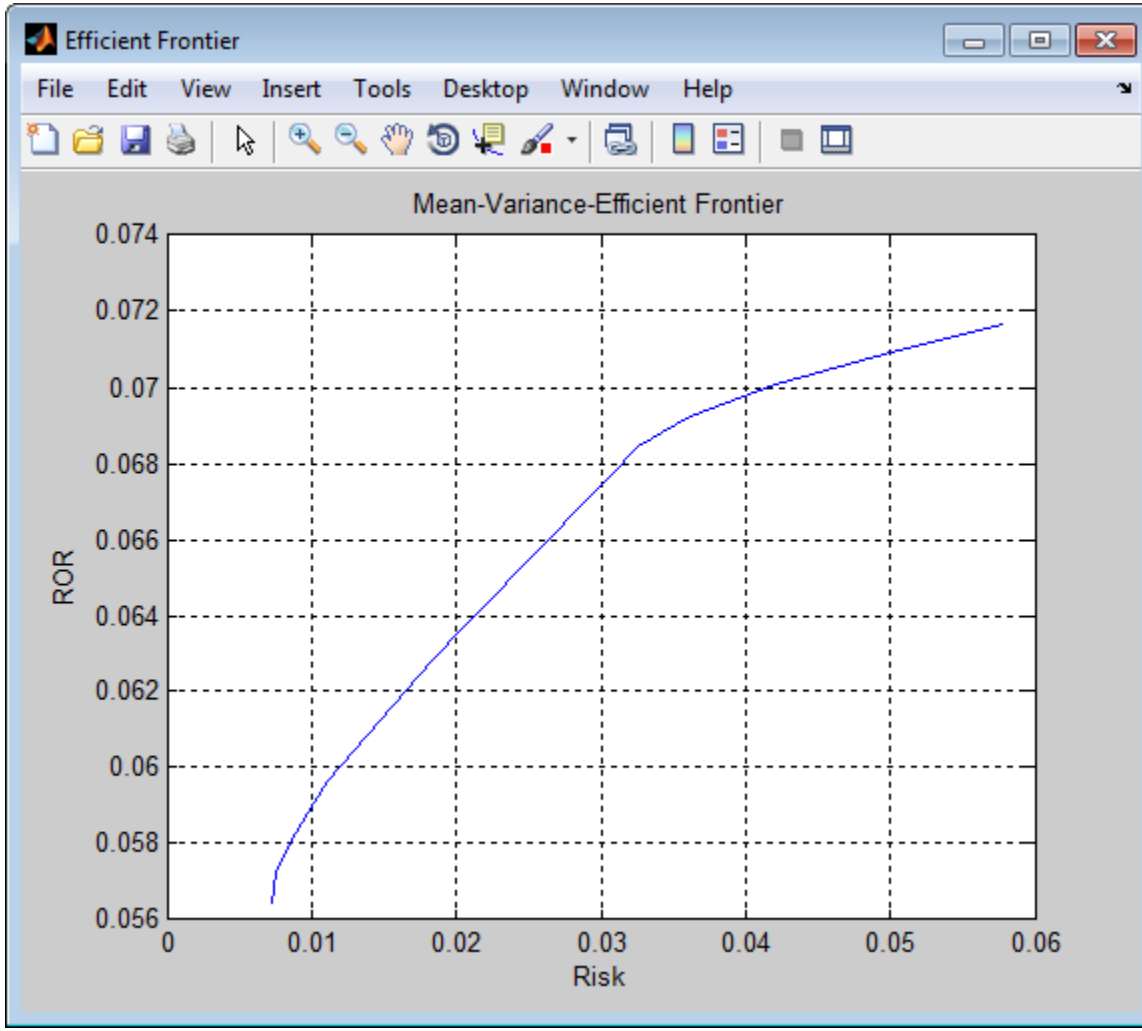
The worksheet looks as follows.

	A	B	C	D	E	F	G	H	I	J
1	**Portfolio Efficient Frontier**									
2								Global	Corp. Bnd	Small Cap
3	**Rates of return**	Global	Corp. Bnd	Small Cap		**Risk**	**ROR**	**Weights**		
4	Nov-91	7.125%	4.125%	8.375%		0.730%	5.643%	0.3%	96.1%	3.5%
5	Nov-92	5.125%	5.125%	3.875%		0.760%	5.723%	4.0%	89.7%	6.3%
6	Nov-93	-1.375%	5.750%	10.500%		0.844%	5.803%	7.7%	83.3%	9.0%
7	Nov-94	7.750%	6.000%	14.750%		0.968%	5.883%	11.3%	76.9%	11.8%
8	Nov-95	8.250%	6.375%	-3.625%		1.118%	5.964%	15.0%	70.5%	14.5%
9	Nov-96	12.625%	6.125%	9.125%		1.287%	6.044%	18.7%	64.0%	17.3%
10						1.466%	6.124%	22.3%	57.6%	20.0%
11						1.653%	6.204%	26.0%	51.2%	22.8%
12						1.846%	6.284%	29.7%	44.8%	25.5%
13	**Spreadsheet Link EX Functions**					2.042%	6.365%	33.3%	38.4%	28.3%
14	1. Transfer data to MATLAB.					2.241%	6.445%	37.0%	32.0%	31.1%
15	0	<== MLPutMatrix("Labels", F3:G3)				2.443%	6.525%	40.6%	25.6%	33.8%
16	0	<== MLPutMatrix("retseries", B4:D9)				2.646%	6.605%	44.3%	19.1%	36.6%
17						2.850%	6.685%	48.0%	12.7%	39.3%
18	2. Execute MATLAB Financial Toolbox functions.					3.055%	6.766%	51.6%	6.3%	42.1%
19	0	<== MLEvalString("[ret, cov] = ewstats(retseries)")				3.262%	6.846%	55.0%	0.0%	45.0%
20	0	<== MLEvalString("[risk, ror, weights] = portopt(ret, cov, 20)")				3.620%	6.926%	41.3%	0.0%	58.7%
21						4.213%	7.006%	27.5%	0.0%	72.5%
22	3. Transfer output data to Excel.					4.955%	7.086%	13.8%	0.0%	86.2%
23	0	<== MLGetMatrix("risk", "sheet5!F4")				5.791%	7.167%	0.0%	0.0%	100.0%
24	0	<== MLGetMatrix("ror", "sheet5!G4")								
25	0	<== MLGetMatrix("weights", "sheet5!H4")								
26										
27	4. Plot efficient frontier data and label the figure.									
28	#MATLAB?	<== MLEvalString("portopt(ret, cov, 20); grid on; xlabel(Labels{1}); ylabel(Labels{2})")								

The data describes the efficient frontier for these three portfolios: that set of points representing the highest rate of return (`ROR`) for a given risk. For each of the 20 points along the frontier, the weighted investment in each portfolio (`Weights`) would achieve that rate of return.

6 Now move to `A28` and press **F2**; then press **Enter** to execute the Financial Toolbox function that plots the efficient frontier for the same portfolio data.

The following figure appears.



The light blue line shows the efficient frontier. Note the change in slope above a 6.8% return because the Corporate Bond portfolio no longer contributes to the efficient frontier.

7 To try running this example using different data, close the figure window and change the data in cells `B4:D9`. Then execute all the Spreadsheet Link

EX functions again. The worksheet then shows the new frontier data, and the MATLAB software displays a new efficient frontier graph.

When you finish this example, close the figure window.

Mapping Time and Bond Cash Flows

This example shows how to use the Financial Toolbox and Spreadsheet Link EX software to compute a set of cash flow amounts and dates, given a portfolio of five bonds with known maturity dates and coupon rates. It is included in the Spreadsheet Link EX product. To run it:

1. Start Excel, Spreadsheet Link EX, and MATLAB sessions.
2. Navigate to the folder *matlabroot*`\toolbox\exlink\`.
3. Open the file `ExliSamp.xls`
4. Execute the example as needed.

Note This example requires Financial Toolbox, Statistics Toolbox, and Optimization Toolbox.

---

1. Click the **Sheet6** tab on `ExliSamp.xls`. The worksheet for this example appears.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	**Cash Flow and Time Mapping for a Portfolio of Bonds**													
2											**Cash Flow Dates**			
3	Settlement Date		26-Jul-99					**Bond1**						
4								**Bond2**						
5			**Bond Data**					**Bond3**						
6								**Bond4**						
7		**Maturity**	**Coupon Rate**					**Bond5**						
8	**Bond1**	15-Nov-99	0.05875											
9	**Bond2**	15-May-00	0.06375											
10	**Bond3**	15-Nov-00	0.08500											
11	**Bond4**	15-May-01	0.08000											
12	**Bond5**	15-Nov-01	0.15750								**Cash Flow Amounts**			
13														
14								**Bond1**						
15								**Bond2**						
16	**Spreadsheet Link EX Functions**							**Bond3**						
17	1. Transfer data to MATLAB.							**Bond4**						
18	#MATLAB' <== MLPutMatrix("maturity",'Maturity')							**Bond5**						
19	#MATLAB' <== MLPutMatrix("cpnrate","CpnRate")													
20	#MATLAB' <== MLPutMatrix("sd",C3)													
21														
22	2. Execute MATLAB Financial Toolbox Cash flow and Time mapping function.													
23	#MATLAB' <== MLEvalString("md = x2mdate(maturity,0); sdm = x2mdate(sd,0)")													
24	#MATLAB' <== MLEvalString("[cfa, cfd] = cfamounts(cpnrate, sdm, md, 2)")													
25														
26	3. Transform date numbers to string cell array.													
27	#MATLAB' <== MLEvalString("i = find(isnan(cfd)); zcfd = cfd; zcfd(i) = 0; scfd=datestr(zcfd,2);")													
28	#MATLAB' <== MLEvalstring("ccfd = num2cell(scfd,2); ccfd(i) = {'N/A'}; ccfd = reshape(ccfd, size(cfd));")													
29	#MATLAB' <== MLEvalString("ccfa = cfa; ccfa(i) = 0; alldates = ccfd(end, :);")													
30														
31	4. Transfer output data to Excel.													
32	#MATLAB' <== MLGetMatrix("ccfd", "sheet6!i3")													
33	#MATLAB' <== MLGetMatrix("alldates", "sheet6!i13")													
34	#MATLAB' <== MLGetMatrix("ccfa", "sheet6!i14")													
35														
36	5. Plot the cash flow diagram.													
37	#MATLAB' <== MLEvalString("cfplot(cfd, cfa); dtaxis('x',6,sdm,50);title('Cash Flow Diagram');xlabel('Cash Flow Dates');ylabel('Bonds');")													

2 Make `A18` the active cell. Press **F2**, then **Enter** to execute the Spreadsheet Link EX function that transfers the column vector `Maturity` to the MATLAB workspace.

3 Make `A19` the active cell to transfer the column vector `Coupon Rate` to the MATLAB workspace.

4 Make `A20` the active cell to transfer the settlement date to the MATLAB workspace.

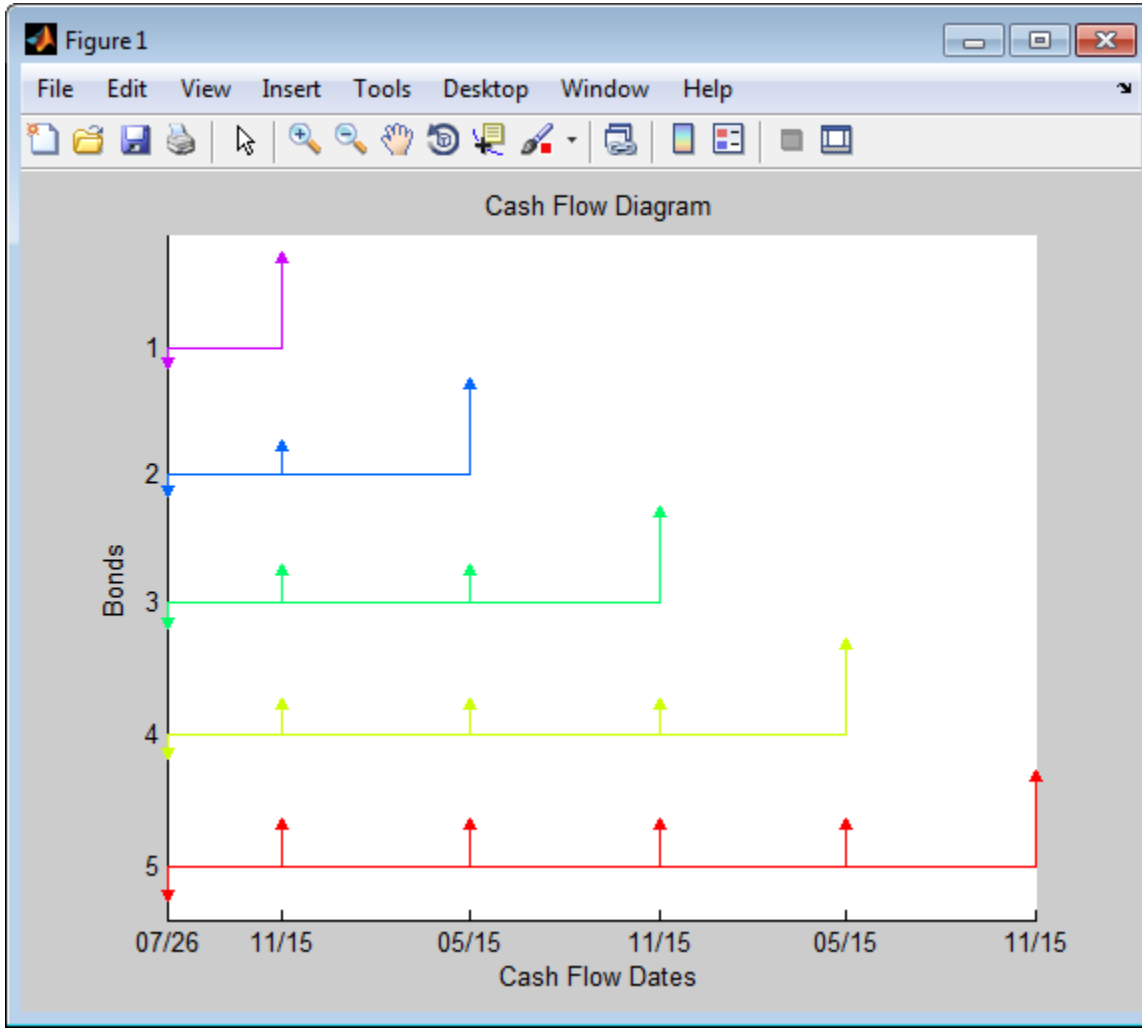
5 Execute the functions in cells `A23` and `A24` to enable the Financial Toolbox software to compute cash flow amounts and dates.

6 Now execute the functions in cells A27 through A29 to transform the dates into string form contained in a cell array.

7 Execute the functions in cells A32 through A34 to transfer the data to the Excel worksheet.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	**Cash Flow and Time Mapping for a Portfolio of Bonds**													
2											**Cash Flow Dates**			
3	Settlement Date		26-Jul-99					**Bond1**	7/26/1999	11/15/1999	N/A	N/A	N/A	N/A
4								**Bond2**	7/26/1999	11/15/1999	5/15/2000	N/A	N/A	N/A
5			**Bond Data**					**Bond3**	7/26/1999	11/15/1999	5/15/2000	11/15/2000	N/A	N/A
6								**Bond4**	7/26/1999	11/15/1999	5/15/2000	11/15/2000	5/15/2001	N/A
7		**Maturity**	**Coupon Rate**					**Bond5**	7/26/1999	11/15/1999	5/15/2000	11/15/2000	5/15/2001	11/15/2001
8	**Bond1**	15-Nov-99	0.05875											
9	**Bond2**	15-May-00	0.06375											
10	**Bond3**	15-Nov-00	0.08500											
11	**Bond4**	15-May-01	0.08000											
12	**Bond5**	15-Nov-01	0.15750											
13											**Cash Flow Amounts**			
14									7/26/1999	11/15/1999	5/15/2000	11/15/2000	5/15/2001	11/15/2001
15								**Bond1**	-1.1495	102.9375	0	0	0	0
16	**Spreadsheet Link EX Functions**							**Bond2**	-1.2473	3.1875	103.1875	0	0	0
17	1. Transfer data to MATLAB.							**Bond3**	-1.6630	4.2500	4.2500	104.2500	0	0
18	0 <== MLPutMatrix("maturity",'Maturity')							**Bond4**	-1.5652	4.0000	4.0000	4.0000	104.0000	0
19	0 <== MLPutMatrix("cpnrate","CpnRate")							**Bond5**	-3.0815	7.8750	7.8750	7.8750	7.8750	107.8750
20	0 <== MLPutMatrix("sd",C3)													
21														
22	2. Execute MATLAB Financial Toolbox Cash flow and Time mapping function.													
23	0 <== MLEvalString("md = x2mdate(maturity,0); sdm = x2mdate(sd,0)")													
24	0 <== MLEvalString("[cfa, cfd] = cfamounts(cpnrate, sdm, md, 2)")													
25														
26	3. Transform date numbers to string cell array.													
27	0 <== MLEvalString("i = find(isnan(cfd)); zcfd = cfd; zcfd(i) = 0; scfd=datestr(zcfd,2);")													
28	0 <== MLEvalstring("ccfd = num2cell(scfd,2); ccfd(i) = {'N/A'}; ccfd = reshape(ccfd, size(cfd));")													
29	0 <== MLEvalString("ccfa = cfa; ccfa(i) = 0; alldates = ccfd(end, :);")													
30														
31	4. Transfer output data to Excel.													
32	0 <== MLGetMatrix("ccfd", "sheet6!i3")													
33	0 <== MLGetMatrix("alldates", "sheet6!i13")													
34	0 <== MLGetMatrix("ccfa", "sheet6!i14")													
35														
36	5. Plot the cash flow diagram.													
37	#MATLAB' <== MLEvalString("cfplot(cfd, cfa); dtaxis('x',6,sdm,50);title('Cash Flow Diagram');xlabel('Cash Flow Dates');ylabel('Bonds');")													

8 Finally, execute the function in cell A37 to display a plot of the cash flows for each portfolio item.



9 When you finish the example, close the figure window.

3

Error Messages and Troubleshooting

Worksheet Cell Errors

You may see these error messages displayed in a worksheet cell.

The first column of the following table contains worksheet cell error messages. The error messages begin with the number sign (#). Most end with an exclamation point (!) or with a question mark (?).

Worksheet Cell Error Messages

Worksheet Cell Error Message	Meaning	Solution
`#COLS>#MAXCOLS!`	Your MATLAB variable exceeds the Microsoft Excel limit of `#MAXCOLS!` columns.	This is a limitation in the Excel product. Try the computation with a variable containing fewer columns.
`#COMMAND!`	The MATLAB software does not recognize the command in an `MLEvalString` function. The command may be misspelled.	Verify the spelling of the MATLAB command. Correct typing errors.
`#DIMENSION!`	You used `MLAppendMatrix` and the dimensions of the appended data do not match the dimensions of the matrix you want to append.	Verify the matrix dimensions and the appended data dimensions, and correct the argument. For more information, see the `MLAppendMatrix` reference page.
`#INVALIDNAME!`	You entered an illegal variable name.	Make sure to use legal MATLAB variable names. MATLAB variable names must start with a letter followed by up to 30 letters, digits, or underscores.
`#INVALIDTYPE!`	You have specified an illegal MATLAB data type with `MLGetVar` or `MLGetMatrix`.	For a list of supported MATLAB data types, see “Classes (Data Types)” in the MATLAB Programming Fundamentals documentation.

Worksheet Cell Error Messages (Continued)

Worksheet Cell Error Message	Meaning	Solution
#MATLAB?	You used a Spreadsheet Link EX function and no MATLAB software session is running.	Start the Spreadsheet Link EX and MATLAB software. See "Startup and Shutdown" on page 1-16.
#NAME?	The function name is unrecognized. The `excllink.xla` add-in is not loaded, or the function name may be misspelled.	Be sure the `excllink.xla` add-in is loaded. See "Add-in Setup" on page 1-8. Check the spelling of the function name. Correct typing errors.
#NONEXIST!	You referenced a nonexistent matrix in an `MLGetMatrix` or `MLDeleteMatrix` function. The matrix name may be misspelled.	Verify the spelling of the MATLAB matrix. Use the MATLAB `whos` command to display existing matrices. Correct typing errors.
#ROWS>#MAXROWS!	Your MATLAB variable exceeds the Excel limit of #MAXROWS! rows.	This is a limitation in the Excel product. Try the computation with a variable containing fewer rows.
#SYNTAX?	You entered a Spreadsheet Link EX function with incorrect syntax. For example, you did not specify double quotation marks (") , or you specified single quotation marks (') instead of double quotation marks.	Verify and correct the function syntax. For more information, see Chapter 5, "Functions — Alphabetical List".

Worksheet Cell Error Messages (Continued)

Worksheet Cell Error Message	Meaning	Solution
`#VALUE!`	An argument is missing from a function, or a function argument is the wrong type.	Supply the correct number of function arguments, of the correct type.
`#VALUE!`	A macro subroutine uses `MLGetMatrix` followed by `MatlabRequest`, which is correct standard usage. A macro function calls that subroutine, and you execute that function from a worksheet cell. The function works correctly, but this message appears in the cell.	Since the function works correctly, ignore the message. Or, in this special case, remove `MatlabRequest` from the subroutine.

Note When you open an Excel worksheet that contains Spreadsheet Link EX functions, the Excel software tries to execute the functions from the bottom up and right to left. Excel may generate cell error messages such as `#COMMAND!` or `#NONEXIST!`. This is expected behavior. Do the following:

1. Ignore the messages.
2. Close MATLAB figure windows.
3. Reexecute the cell functions one at a time in the correct order by pressing **F2**, and then **Enter**.

Microsoft Excel Errors

The Excel software may display one of the following error messages.

Excel Error Messages

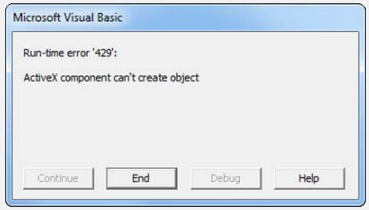
Error Message	Cause of Error	Solution
`Error in formula`	You entered a formula incorrectly. Common errors include a space between the function name and the left parenthesis; or missing, extra, or mismatched parentheses.	Check entry and correct typing errors.
`Can't find project or library`	You tried to execute a macro and the location of `excllink.xla` is incorrect.	Click **OK**. The References window opens. Remove the check from `MISSING: excllink.xla`. Find `excllink.xla` in its correct location, select its check box in the References window, and click **OK**.
`Run-time error '1004': Cells method of Application class failed`	You used `MLGetMatrix` and the matrix is larger than the space available in the worksheet. This error destabilizes the Spreadsheet Link EX software session and changes worksheet calculation mode to manual.	Click **OK**. Reset worksheet calculation mode to `automatic`, and save your worksheet as needed. Restart the Excel, Spreadsheet Link EX, and MATLAB software sessions.

Excel Error Messages (Continued)

Error Message	Cause of Error	Solution
`MATLAB failed to check out a license of Spreadsheet Link EX or does not have a valid installation of Spreadsheet Link EX`	You entered an invalid license passcode or did not install Spreadsheet Link EX properly.	Check that you entered the license passcode properly. Reinstall the Spreadsheet Link EX add-on. (See "Installation" on page 1-5.) If you followed the installation guidelines, used a proper passcode and you are still unable to start the Spreadsheet Link EX software, contact your MathWorks representative.
`Datasource: Excel; prompt for user name and password`	This message appears when an attempt to connect to the Excel software from the Database Toolbox™ software fails.	Make sure that the Excel spreadsheet referenced by the data source exists, then retry the connection.

Excel Error Message Boxes

Error Message Box	Cause of Error	Solution

	This error appears when you start the automation server from the Excel interface, and multiple versions of the MATLAB software are installed on your desktop.	To correct this error, perform the following:
		1 Shut down all MATLAB and Excel instances.
		2 Open a Command Prompt window, and using `cd`, change to the `bin\win32` subfolder of the MATLAB installation folder.
		3 Type the command:
		`.\matlab /regserver`
		4 When the MATLAB session starts, close it. Using `/regserver` fixes the registry entries.
		5 Start an Excel session. The Spreadsheet Link EX add-in now loads properly.
		6 Verify that the Spreadsheet Link EX software is working by entering the following command from the MATLAB Command Window:
		`a = 3.14159`
		7 Enter the following formula in cell `A1` of the open Excel worksheet:
		`=mlgetmatrix("a","a1")`
		8 The value `3.14159` appears in cell `A1`.

Data Errors

In this section...

Matrix Data Errors

Data in the MATLAB or Microsoft Excel workspaces may produce the following errors.

Data Errors

Data Error	Cause	Solution
`MATLAB matrix cells contain zeros (0).`	Corresponding Excel worksheet cells are empty.	Excel worksheet cells must contain only numeric or string data.
`MATLAB matrix is a 1-by-1 zero matrix.`	You used quotation marks around the data-location argument in `MLPutMatrix` or `MLAppendMatrix`.	Correct the syntax to remove quotation marks.
`MATLAB matrix is empty ([ ]).`	You referenced a nonexistent VBA variable in `MLPutVar`.	Correct the macro; you may have typed the variable name incorrectly.
`VBA matrix is empty.`	You referenced a nonexistent MATLAB variable in `MLGetVar`.	Correct the macro; you may have typed the variable name incorrectly.

Errors When Opening Saved Worksheets

This section describes errors that you may encounter when opening saved worksheets.

- When you open an Excel worksheet that contains Spreadsheet Link EX functions, the Excel software tries to execute the functions from the bottom

up and right to left. Excel may generate cell error messages such as `#COMMAND!` or `#NONEXIST!`. This is expected behavior. Do the following:

1. Ignore the messages.
2. Close MATLAB figure windows.
3. Reexecute the cell functions one at a time in the correct order by pressing **F2**, and then **Enter**.

- If you save an Excel worksheet containing Spreadsheet Link EX functions, and then reopen it in an environment where the `excllink.xla` add-in is in a different location, you may see the message: `This document contains links: Re-establish links?`

  To address this issue, do the following:

  1. Click **No**.
  2. Select **Edit > Links**.
  3. In the Links dialog box, click **Change Source**.
  4. In the Change Links dialog box, select *`matlabroot`*`\toolbox\exlink\excllink.xla`.
  5. Click **OK**.

     The Excel software executes each function as it changes its link. You may see MATLAB figure windows and hear error beeps as the links change and functions execute; ignore them.
  6. In the Links dialog box, click **OK**.

     The worksheet now connects to the Spreadsheet Link EX add-in.

  Or, instead of using the **Links** menu, you can manually edit the link location in each affected worksheet cell to show the correct location of `excllink.xla`.

Startup Errors

If you have enabled `MLAutoStart`, double-clicking an `xls` file in the MATLAB Current Folder browser and choosing **Open Outside MATLAB** causes a Microsoft Excel error to appear. To open the file successfully, click **End** in the error window.

To avoid this issue, disable `MLAutoStart`. Start MATLAB sessions from the Excel interface by clicking the **startmatlab** button in the Excel menu bar.

Audible Error Signals

You may hear audible errors while passing data to the MATLAB workspace using `MLPutMatrix` or `MLAppendMatrix`. These errors usually indicate that you have insufficient computer memory to carry out the operation. Close other applications or clear unnecessary variables from the MATLAB workspace and try again. If the error signal reoccurs, you probably have insufficient physical memory in your computer for this operation.

4

Function Reference

Link Management

`matlabinit`	Initialize Spreadsheet Link EX software and start MATLAB process
`MLAutoStart`	Automatically start MATLAB process
`MLClose`	Stop MATLAB process
`MLOpen`	Start MATLAB process
`MLUseCellArray`	Toggle `MLPutMatrix` to use MATLAB cell arrays

Data Management

`matlabfcn`	Evaluate MATLAB command given Microsoft Excel data
`matlabsub`	Evaluate MATLAB command given Microsoft Excel data and designate output location
`MLAppendMatrix`	Create or append MATLAB matrix with data from Microsoft Excel worksheet
`MLDeleteMatrix`	Delete MATLAB matrix
`MLEvalString`	Evaluate command in MATLAB
`MLGetFigure`	Import current MATLAB figure into Microsoft Excel spreadsheet
`MLGetMatrix`	Write contents of MATLAB matrix to Microsoft Excel worksheet
`MLGetVar`	Write contents of MATLAB matrix in Microsoft Excel VBA variable
`MLMissingDataAsNaN`	Set empty cells to `NaN` or `0`
`MLPutMatrix`	Create or overwrite MATLAB matrix with data from Microsoft Excel worksheet
`MLPutVar`	Create or overwrite MATLAB matrix with data from Microsoft Excel VBA variable
`MLShowMatlabErrors`	Return standard Spreadsheet Link EX errors or full MATLAB errors using `MLEvalString`
`MLStartDir`	Specify MATLAB current working folder after startup
`MLUseFullDesktop`	Specify whether to use full MATLAB desktop or MATLAB Command Window

5

Functions — Alphabetical List

matlabfcn

Purpose

Evaluate MATLAB command given Microsoft Excel data

Syntax

```
matlabfcn(command,inputs)
```

Description

`matlabfcn(command,inputs)` passes the command to the MATLAB workspace for evaluation, given the function input data. The function returns a single value or string depending upon the MATLAB output. The result is returned to the calling worksheet cell. *This function is intended for use as an Excel worksheet function.*

Tips

- If `matlabfcn` fails, then by default you get a standard Spreadsheet Link EX error, such as `#COMMAND`. To return MATLAB error strings, use `MLShowMatlabErrors`.

Input Arguments

`command`

MATLAB command to evaluate.

Embed the command in double quotes, for example, `"command"`.

`inputs`

Variable length input argument list passed to a MATLAB command.

The argument list may contain a range of worksheet cells that contain input data.

Examples

Compute the Sum of Excel Data and Return the Result to an Active Cell

Add the data in worksheet cells `B1` through `B10` returning the sum to the active worksheet cell:

```
matlabfcn("sum", B1:B10)
```

Plot Excel Data Using the MATLAB Plotting Function

Plot the data in worksheet cells `B1` through `B10`, using `x` as the marker type:

```
matlabfcn("plot", B1:B10, "x")
```

See Also

matlabsub | MLShowMatlabErrors

matlabinit

Purpose

Initialize Spreadsheet Link EX software and start MATLAB process

Syntax

```
matlabinit
```

Description

`matlabinit` Initializes the Spreadsheet Link EX software and starts MATLAB process. If the Spreadsheet Link EX software has been initialized and the MATLAB software is running, subsequent invocations do nothing. Use `matlabinit` to start Spreadsheet Link EX and MATLAB sessions manually when you have set `MLAutoStart` to `no`. If you set `MLAutoStart` to `yes`, `matlabinit` executes automatically.

Tips

- To run `matlabinit` from the Microsoft Excel toolbar, click **Tools > Macro**. In the **Macro Name/Reference** box, enter `matlabinit` and click **Run**. Alternatively, you could include this function in a macro subroutine. You cannot run `matlabinit` as a worksheet cell formula or in a macro function.

See Also

`MLAutoStart | MLOpen`

Purpose

Evaluate MATLAB command given Microsoft Excel data and designate output location

Syntax

```
matlabsub(command,edat,inputs)
```

Description

`matlabsub(command,edat,inputs)` passes the specified command to the MATLAB workspace for evaluation, given the function input data. The function returns a single value or string depending upon the MATLAB output. *This function is intended for use as an Excel worksheet function.*

Tips

- To return an array of data to the Microsoft Excel Visual Basic for Applications (VBA) workspace, see `MLEvalString` and `MLGetVar`.
- `edat` must not include the cell that contains the `matlabsub` function. In other words, be careful not to overwrite the function itself.
- Ensure that there is enough room in the worksheet to write the matrix contents. If there is insufficient room, the function generates a fatal error.
- If `matlabsub` fails, then by default you get a standard Spreadsheet Link EX error, such as `#COMMAND`. To return MATLAB error strings, use `MLShowMatlabErrors`.

Input Arguments

`command`

MATLAB command to evaluate.

Enter the MATLAB command in double quotes, for example, `"command"`.

`edat`

Worksheet location where the function writes the returned data.

`edat` in quotes directly specifies the location.`edat` without quotes specifies a worksheet cell address (or range name) that contains a reference to the location. In both cases, `edat` must be a cell address or a range name.

Although you can specify a range of output cells, `matlabsub` does not support multiple outputs. Instead of returning multiple outputs, `matlabsub` returns the first output starting in the first cell from the specified range, and discards all other outputs.

`inputs`

Variable length input argument list passed to MATLAB command.

This argument list can contain a range of worksheet cells that contain input data.

Examples

Compute the Sum of Data and Return Result to the Specified Cell

Sum the data in worksheet cells `B1` through `B10` returning the output to cell `A1`:

```
matlabsub("sum", "A1", B1:B10)
```

See Also

`matlabfcn | MLShowMatlabErrors`

Purpose

Create or append MATLAB matrix with data from Microsoft Excel worksheet

Syntax

```
MLAppendMatrix(var_name,mdat)
MLAppendMatrix var_name,mdat)
out = MLAppendMatrix(var_name,mdat)
```

Description

`MLAppendMatrix(var_name,mdat)` appends data in `mdat` to MATLAB matrix `var_name` or creates `var_name` if it does not exist. *Use this syntax when working directly in a worksheet.*

`MLAppendMatrix var_name,mdat)` appends data in `mdat` to MATLAB matrix `var_name` or creates `var_name` if it does not exist. *Use this syntax in a VBA macro.*

`out = MLAppendMatrix(var_name,mdat)` lets you catch errors when executing `MLAppendMatrix` in a VBA macro. If `MLAppendMatrix` fails, then `out` is a string containing error code. Otherwise, `out` is `0`.

Tips

- `MLAppendMatrix` checks the dimensions of `var_name` and `mdat` to determine how to append `mdat` to `var_name`. If the dimensions allow appending `mdat` as either new rows or new columns, it appends `mdat` to `var_name` as new rows. If the dimensions do not match, the function returns an error.
- If `mdat` is not initially an Excel `Range` data type and you call the function from a worksheet, `MLAppendMatrix` performs the necessary type coercion.
- If `mdat` is not an Excel `Range` data type and you call the function from within a Microsoft Visual Basic macro, the call fails. The error message `ByRef Argument Type Mismatch` appears.

Input Arguments

`var_name`

Name of MATLAB matrix to which to append data.

`var_name` in quotes directly specifies the matrix name. `var_name` without quotes specifies a worksheet cell address (or range name) that

contains the matrix name. Do not use the MATLAB variable `ans` as `var_name`.

`mdat`

Location of data to append to `var_name`.

`mdat` must be a worksheet cell address or range name. Do not enclose it in quotes.

`mdat` must contain either numeric data or string data. Data types cannot be combined within the range specified in `mdat`. Empty `mdat` cells become MATLAB matrix elements containing zero if the data is numeric, and empty strings if the data is a string.

Output Arguments

`out`

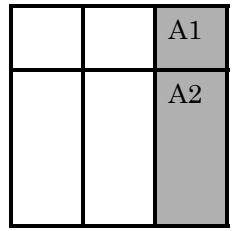
`0` if the command succeeded. Otherwise, a string containing error code.

Examples

Append Data from a Worksheet Cell Range to a MATLAB Matrix

In this example, `B` is a 2-by-2 MATLAB matrix. Append the data in worksheet cell range `A1:A2` to `B`:

```
MLAppendMatrix("B", A1:A2)
```



`B` is now a 2-by-3 matrix with the data from `A1:A2` in the third column.

Append Data from a Named Worksheet Cell Range to a MATLAB Matrix

`B` is a 2-by-2 MATLAB matrix. Cell `C1` contains the label (string) `B`, and `new_data` is the name of the cell range `A1:B2`. Append the data in cell range `A1:B2` to `B`:

```
MLAppendMatrix(C1, new_data)
```

A1	B1
A2	B2

`B` is now a 4-by-2 matrix with the data from `A1:B2` in the last two rows.

See Also

`MLPutMatrix`

MLAutoStart

Purpose

Automatically start MATLAB process

Syntax

```
MLAutoStart(flag)
MLAutoStart flag
out = MLAutoStart(flag)
```

Description

`MLAutoStart(flag)` sets automatic startup of the Spreadsheet Link EX and MATLAB software. A change of state takes effect the next time an Excel session starts. *Use this syntax when working directly in a worksheet.*

`MLAutoStart flag` sets automatic startup of the Spreadsheet Link EX and MATLAB software. A change of state takes effect the next time an Excel session starts. *Use this syntax in a VBA macro.*

`out = MLAutoStart(flag)` lets you catch errors when executing `MLAutoStart` in a VBA macro. If `MLAutoStart` fails, then `out` is a string containing error code. Otherwise, `out` is `0`.

Tips

- If Spreadsheet Link EX and MATLAB are running, then `MLAutoStart("no")` does not stop them.

Input Arguments

`flag`

Either `"yes"` or `"no"`.

Specify `"yes"` to automatically start the Spreadsheet Link EX and MATLAB software every time a Microsoft Excel session starts. Specify `"no"` to cancel automatic startup of the Spreadsheet Link EX and MATLAB software.

Default: `"yes"`

Output Arguments

`out`

`0` if the command succeeded. Otherwise, a string containing error code.

Examples

Cancel Automatic Startup of Spreadsheet Link EX and MATLAB

Enter this command in a worksheet:

```
MLAutoStart("no")
```

Spreadsheet Link EX and MATLAB do not start on subsequent Excel session invocations.

See Also

`matlabinit` | `MLClose` | `MLOpen`

More About

- "Automatically Starting the Spreadsheet Link EX Software" on page 1-16

MLClose

Purpose

Stop MATLAB process

Syntax

```
MLClose()
MLClose
out = MLClose()
```

Description

`MLClose()` ends the MATLAB process, deletes all variables from the MATLAB workspace, and tells the Microsoft Excel software that the MATLAB software is no longer running. *Use this syntax when working directly in a worksheet.*

`MLClose` ends the MATLAB process, deletes all variables from the MATLAB workspace, and tells the Microsoft Excel software that the MATLAB software is no longer running. *Use this syntax in a VBA macro.*

`out = MLClose()` lets you catch errors when executing `MLClose` in a VBA macro. If `MLClose` fails, then `out` is a string containing error code. Otherwise, `out` is `0`.

Tips

- If you use `MLClose` when no MATLAB process is running, nothing happens.

Output Arguments

`out`

`0` if the command succeeded. Otherwise, a string containing error code.

Examples

End the MATLAB Session

End the MATLAB session from a worksheet:

```
MLClose()
```

See Also

`MLAutoStart` | `MLOpen`

More About

- "Stopping the Spreadsheet Link EX Software" on page 1-18

Purpose

Delete MATLAB matrix

Syntax

```
MLDeleteMatrix(var_name)
MLDeleteMatrix var_name
out = MLDeleteMatrix(var_name)
```

Description

`MLDeleteMatrix(var_name)` deletes the named matrix from the MATLAB workspace. *Use this syntax when working directly in a worksheet.*

`MLDeleteMatrix var_name` deletes the named matrix from the MATLAB workspace. *Use this syntax in a VBA macro.*

`out = MLDeleteMatrix(var_name)` lets you catch errors when executing `MLDeleteMatrix` in a VBA macro. If `MLDeleteMatrix` fails, then `out` is a string containing error code. Otherwise, `out` is `0`.

Input Arguments

`var_name`

Name of MATLAB matrix to delete.

`var_name` in quotes directly specifies the matrix name. `var_name` without quotes specifies a worksheet cell address (or range name) that contains the matrix name.

Output Arguments

`out`

`0` if the command succeeded. Otherwise, a string containing error code.

Examples

Delete a Matrix from the MATLAB Workspace

Delete matrix `A` from the MATLAB workspace:

```
MLDeleteMatrix("A")
```

See Also

`MLAppendMatrix | MLGetMatrix | MLPutMatrix`

MLEvalString

Purpose

Evaluate command in MATLAB

Syntax

```
MLEvalString(command)
MLEvalString command
out = MLEvalString(command)
```

Description

`MLEvalString(command)` passes a command string to the MATLAB software for evaluation. *Use this syntax when working directly in a worksheet.*

`MLEvalString command` passes a command string to the MATLAB software for evaluation. *Use this syntax in a VBA macro.*

`out = MLEvalString(command)` lets you catch errors when executing `MLEvalString` in a VBA macro. If `MLEvalString` fails, then `out` is a string containing error code or error message. Otherwise, `out` is `0`.

Tips

- The specified action alters only the MATLAB workspace. It has no effect on the Microsoft Excel workspace.
- If `MLEvalString` fails, then by default you get a standard Spreadsheet Link EX error, such as `#COMMAND`. To return MATLAB error strings, use `MLShowMatlabErrors`.

Input Arguments

`command`

MATLAB command to evaluate.

`command` in quotes directly specifies the command. `command` without quotes specifies a worksheet cell address (or range name) that contains the command.

Output Arguments

`out`

`0` if the command succeeded. Otherwise, a string containing error code or error message. To return MATLAB error messages instead of error code, use `MLShowMatlabErrors`.

Examples

Evaluate a MATLAB Command from an Excel Worksheet

Divide the MATLAB variable `b` by 2, and then plot it:

```
MLEvalString("b = b/2;plot(b)")
```

This command only modifies the MATLAB variable `b`. To update data in the Excel worksheet, use `MLGetMatrix`.

See Also

`MLGetMatrix | MLShowMatlabErrors`

MLGetFigure

Purpose

Import current MATLAB figure into Microsoft Excel spreadsheet

Syntax

```
MLGetFigure(width,height)
MLGetFigure width, height
out = MLGetFigure(width,height)
```

Description

`MLGetFigure(width,height)` import the current MATLAB figure into an Excel worksheet, where the top-left corner of the figure is the current spreadsheet cell. *Use this syntax when working directly in a worksheet.*

`MLGetFigure width, height` import the current MATLAB figure into an Excel worksheet, where the top-left corner of the figure is the current spreadsheet cell. *Use this syntax in a VBA macro.*

`out = MLGetFigure(width,height)` lets you catch errors when executing `MLGetFigure` in a VBA macro. If `MLGetFigure` fails, then `out` is a string containing error code. Otherwise, `out` is `0`.

Tips

- If worksheet calculation mode is automatic, `MLGetFigure` executes when you enter the formula in a cell. If worksheet calculation mode is manual, enter the `MLGetFigure` function in a cell, then press `F9` to execute it. Remember that pressing `F9` in this situation can also reexecute other worksheet functions and generate unpredictable results.
- If you use `MLGetFigure` in a macro subroutine, enter `MatlabRequest` on the line after the `MLGetFigure`. `MatlabRequest` initializes internal Spreadsheet Link EX variables and enables `MLGetFigure` to function in a subroutine. Do not include `MatlabRequest` in a macro function unless the function is called from a subroutine.

Input Arguments

`width`

Width (in normalized units) of the MATLAB figure when imported into an Excel worksheet.

`height`

Height (in normalized units) of the MATLAB figure when imported into an Excel worksheet.

Output Arguments

`out`

`0` if the command succeeded. Otherwise, a string containing error code.

Examples

Import a MATLAB Figure into an Excel Worksheet

Import the current MATLAB figure into an Excel worksheet. Adjust the width of the figure to be half that of the original figure, and the height to be a quarter that of the original figure:

```
MLGetFigure(.50,.25)
```

See Also

`MLGetMatrix | MLGetVar`

MLGetMatrix

Purpose

Write contents of MATLAB matrix to Microsoft Excel worksheet

Syntax

```
MLGetMatrix(var_name,edat)
MLGetMatrix var_name, edat
out = MLGetMatrix(var_name,edat)
```

Description

`MLGetMatrix(var_name,edat)` writes the contents of MATLAB matrix `var_name` in the Excel worksheet, beginning in the upper-left cell specified by `edat`. *Use this syntax when working directly in a worksheet.*

`MLGetMatrix var_name, edat` writes the contents of MATLAB matrix `var_name` in the Excel worksheet, beginning in the upper-left cell specified by `edat`. *Use this syntax in a VBA macro.*

`out = MLGetMatrix(var_name,edat)` lets you catch errors when executing `MLGetMatrix` in a VBA macro. If `MLGetMatrix` fails, then `out` is a string containing error code. Otherwise, `out` is `0`.

Tips

- If data exists in the specified worksheet cells, it is overwritten.
- If the dimensions of the MATLAB matrix are larger than that of the specified cells, the data overflows into additional rows and columns.
- `edat` must not include the cell that contains the `MLGetMatrix` function. In other words, be careful not to overwrite the function itself. Also make sure there is enough room in the worksheet to write the matrix contents. If there is insufficient room, the function generates a fatal error.
- `MLGetMatrix` function does not automatically adjust cell addresses. If `edat` is an explicit cell address, edit it to correct the address when you do either of the following:
  - Insert or delete rows or columns.
  - Move or copy the function to another cell.
- If worksheet calculation mode is automatic, `MLGetMatrix` executes when you enter the formula in a cell. If worksheet calculation mode is manual, enter the `MLGetMatrix` function in a cell, and then press

F9 to execute it. However, pressing **F9** in this situation may also reexecute other worksheet functions and generate unpredictable results.

- If you use `MLGetMatrix` in a macro subroutine, enter `MatlabRequest` on the line after the `MLGetMatrix`. `MatlabRequest` initializes internal Spreadsheet Link EX variables and enables `MLGetMatrix` to function in a subroutine. Do not include `MatlabRequest` in a macro function unless the function is called from a subroutine.

Input Arguments

`var_name`

Name of MATLAB matrix to access.

`var_name` in quotes directly specifies the matrix name. `var_name` without quotes specifies a worksheet cell address (or range name) that contains the matrix name. Do not use the MATLAB variable `ans` as `var_name`.

`edat`

Worksheet location where the function writes the contents of `var_name`.

`edat` in quotes directly specifies the location. `edat` without quotes specifies a worksheet cell address (or range name) that contains a reference to the location. In both cases, `edat` must be a cell address or a range name.

Output Arguments

`out`

`0` if the command succeeded. Otherwise, a string containing error code.

Examples

Specify the Matrix Name and Location Directly

Write the contents of the MATLAB matrix `bonds` starting in cell `C10` of `Sheet2`. If `bonds` is a 4-by-3 matrix, fill cells `C10..E13` with data:

```
MLGetMatrix("bonds", "Sheet2!C10")
```

Specify the Matrix Name and Location Indirectly

Access the MATLAB matrix named by the string in worksheet cell `B12`. Write the contents of the matrix to the worksheet starting at the location named by the string in worksheet cell `B13`:

```
MLGetMatrix(B12, B13)
```

Use `MLGetMatrix` in a VBA Macro

Write the contents of MATLAB matrix `A` to the worksheet, starting at the cell named by `RangeA`:

```
Sub Get_RangeA()
MLGetMatrix "A", "RangeA"
MatlabRequest
End Sub
```

Use the `Address` Property of the Range Object to Specify Location

In a macro, use the `Address` property of the range object returned by the VBA `Cells` function to specify where to write the data:

```
Sub Get_Variable()
MLGetMatrix "X", Cells(3, 2).Address
MatlabRequest
End Sub
```

Catch Errors in a VBA Macro

Use this function to get the variable `A` from MATLAB and to test if the command succeeded:

```
Sub myfun()
    Dim out As Variant

    out = MLGetMatrix("A", "A1")
```

```
    If out <> 0 Then
        MsgBox out
    End If
    MatlabRequest
End Sub
```

If `MLGetMatrix` fails, `myfun` displays a message box with the error code.

See Also

`MLAppendMatrix` | `MLPutMatrix`

MLGetVar

Purpose

Write contents of MATLAB matrix in Microsoft Excel VBA variable

Syntax

```
MLGetVar ML_var_name, VBA_var_name
out = MLGetVar ML_var_name, VBA_var_name
```

Description

`MLGetVar ML_var_name, VBA_var_name` writes the contents of MATLAB matrix `ML_var_name` in the Excel Visual Basic for Applications (VBA) variable `VBA_var_name`. Creates `VBA_var_name` if it does not exist. Replaces existing data in `VBA_var_name`.

`out = MLGetVar ML_var_name, VBA_var_name` lets you catch errors when executing `MLGetVar`. If `MLGetVar` fails, then `out` is a string containing error code. Otherwise, `out` is `0`.

Input Arguments

`ML_var_name`

Name of MATLAB matrix to access.

`ML_var_name` in quotes directly specifies the matrix name. `ML_var_name` without quotes specifies a VBA variable that contains the matrix name as a string. Do not use the MATLAB variable `ans` as `ML_var_name`. If defined, `ML_var_name` must be of type `VARIANT`. Any other type will give a `"TYPE MISMATCH"` error.

`VBA_var_name`

Name of VBA variable where the function writes the contents of `ML_var_name`.

Use `VBA_var_name` without quotes.

Output Arguments

`out`

`0` if the command succeeded. Otherwise, a string containing error code.

Examples

Write the Contents of a MATLAB Matrix into a VBA Variable

Write the contents of the MATLAB matrix `J` into the VBA variable `DataJ`:

```
Sub Fetch()
MLGetVar "J", DataJ
End Sub
```

See Also

MLPutVar

MLMissingDataAsNaN

Purpose

Set empty cells to `NaN` or `0`

Syntax

```
MLMissingDataAsNaN(flag)
MLMissingDataAsNaN flag
out = MLMissingDataAsNaN(flag)
```

Description

`MLMissingDataAsNaN(flag)` sets empty cells to `NaN` or `0`. When the Spreadsheet Link EX software is installed, the default is `"no"`, so empty cells are handled as `0`s. If you change the value of `MLUseCellArray` to `"yes"`, the change remains in effect the next time a Microsoft Excel session starts. *Use this syntax when working directly in a worksheet.*

`MLMissingDataAsNaN flag` sets empty cells to `NaN` or `0`. *Use this syntax in a VBA macro.*

`out = MLMissingDataAsNaN(flag)` lets you catch errors when executing `MLMissingDataAsNaN` in a VBA macro. If `MLMissingDataAsNaN` fails, then `out` is a string containing error code. Otherwise, `out` is `0`.

Tips

- A string in an Excel range always forces cell array output and empty cells as `NaN`s.

Input Arguments

`flag`

Either `"yes"` or `"no"`.

Specify `"yes"` to set empty cells to use `NaN`s. Specify `"no"` to set empty cells to use `0`s.

Default: `"no"`

Output Arguments

`out`

`0` if the command succeeded. Otherwise, a string containing error code.

Examples

Set Empty Cells to Use 0s

Cancel the use of the value `NaN` for empty cells:

```
MLMissingDataAsNaN("no")
```

See Also

MLPutMatrix

MLOpen

Purpose

Start MATLAB process

Syntax

```
MLOpen()
MLOpen
out = MLOpen()
```

Description

`MLOpen()` starts MATLAB process. Use `MLOpen` to restart the MATLAB session after you have stopped it with `MLClose` in a given Microsoft Excel session. *Use this syntax when working directly in a worksheet.*

`MLOpen` starts MATLAB process. Use `MLOpen` to restart the MATLAB session after you have stopped it with `MLClose` in a given Microsoft Excel session. *Use this syntax in a VBA macro.*

`out = MLOpen()` lets you catch errors when executing `MLOpen` in a VBA macro. If `MLOpen` fails, then `out` is a string containing error code. Otherwise, `out` is `0`.

Tips

- If a MATLAB process has already started, subsequent calls to `MLOpen` do nothing.
- To start a MATLAB session and initialize the Spreadsheet Link EX software, use `matlabinit` rather than `MLOpen`.

Output Arguments

`out`

`0` if the command succeeded. Otherwise, a string containing error code.

Examples

Start a MATLAB Session

Start a MATLAB session from a worksheet:

```
MLOpen()
```

See Also

`matlabinit | MLClose`

Purpose

Create or overwrite MATLAB matrix with data from Microsoft Excel worksheet

Syntax

```
MLPutMatrix(var_name, mdat)
MLPutMatrix var_name, mdat
out = MLPutMatrix(var_name,mdat)
```

Description

`MLPutMatrix(var_name, mdat)` creates or overwrites matrix `var_name` in MATLAB workspace with specified data in `mdat`. Creates `var_name` if it does not exist. *Use this syntax when working directly in a worksheet.*

`MLPutMatrix var_name, mdat` creates or overwrites matrix `var_name` in MATLAB workspace with specified data in `mdat`. *Use this syntax in a VBA macro.*

`out = MLPutMatrix(var_name,mdat)` lets you catch errors when executing `MLPutMatrix` in a VBA macro. If `MLPutMatrix` fails, then `out` is a string containing error code. Otherwise, `out` is `0`.

Tips

- If `var_name` exists, this function replaces the contents with `mdat`.
- Empty numeric data cells within the range of `mdat` become numeric zeros within the MATLAB matrix identified by `var_name`.
- If any element of `mdat` contains string data, `mdat` is exported as a MATLAB cell array. Empty string elements within the range of `mdatmdat` become `NaN`s within the MATLAB cell array.
- When using `MLPutMatrix` in a subroutine, indicate the source of the worksheet data using the Microsoft Excel macro `Range`. For example:

  ```
  Sub test()
    MLPutMatrix "a", Range("A1:A3")
  End Sub
  ```

  If you have a named range in your worksheet, you can specify the name instead of the range; for example:

  ```
  Sub test()
  ```

```
  MLPutMatrix "a", Range("temp")
End Sub
```

where `temp` is a named range in your worksheet.

Input Arguments

`var_name`

Name of MATLAB matrix to create or overwrite.

`var_name` in quotes directly specifies the matrix name. `var_name` without quotes specifies a worksheet cell address (or range name) that contains the matrix name.

`mdat`

Location of data to copy into `var_name`.

`mdat` must be a worksheet cell address or range name. Do not enclose it in quotes.

Output Arguments

`out`

`0` if the command succeeded. Otherwise, a string containing error code.

Examples

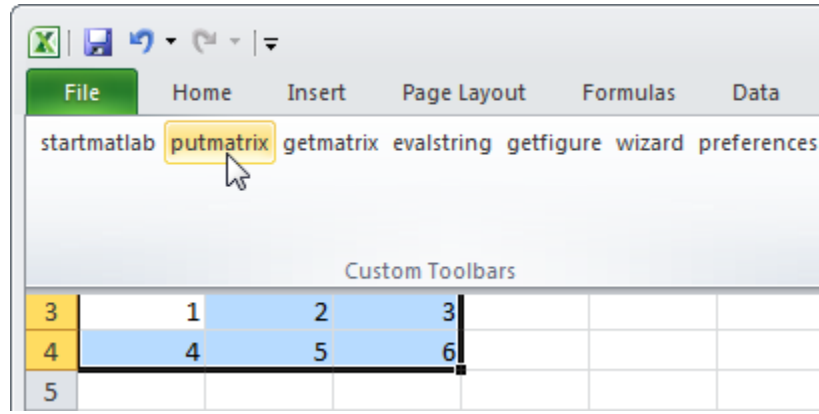
Create or Overwrite a Matrix in the MATLAB Workspace

Create or overwrite matrix `A` in the MATLAB workspace with the data in the worksheet range `A1:C3`:

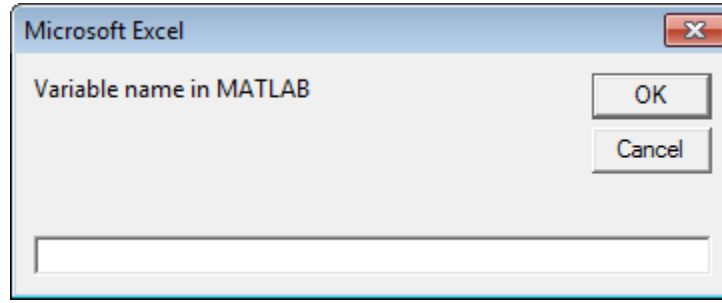
```
MLPutMatrix "A", Range("A1:C3")
```

Import Data from a Microsoft Excel Worksheet to the MATLAB Workspace Using the putmatrix Toolbar Button

1. In the Excel worksheet, select the columns and/or rows you want to export to the MATLAB workspace.



2 Click the **putmatrix** button on the Spreadsheet Link EX toolbar. A window appears that prompts you to specify the name of the MATLAB variable in which you want to store your data.



3 Enter `newmatrix` for the MATLAB variable name.

4 Click **OK**.

Now you can manipulate `newmatrix` in the MATLAB Command Window.

```
newmatrix
newmatrix =
```

```
     1     2     3
     4     5     6
```

See Also

MLAppendMatrix | MLGetMatrix

Purpose

Create or overwrite MATLAB matrix with data from Microsoft Excel VBA variable

Syntax

```
MLPutVar ML_var_name, VBA_var_name
out = MLPutVar ML_var_name, VBA_var_name
```

Description

`MLPutVar ML_var_name, VBA_var_name` creates or overwrites matrix `ML_var_name` in MATLAB workspace with data in `VBA_var_name`. Creates `ML_var_name` if it does not exist. If `ML_var_name` exists, this function replaces the contents with data from `VBA_var_name`.

`out = MLPutVar ML_var_name, VBA_var_name` lets you catch errors when executing `MLPutVar`. If `MLPutVar` fails, then `out` is a string containing error code. Otherwise, `out` is `0`.

Tips

- Use `MLPutVar` only in a macro subroutine, not in a macro function or in a subroutine called by a function.
- Empty numeric data cells within `VBA_var_name` become numeric zeros within the MATLAB matrix identified by `ML_var_name`.
- If any element of `VBA_var_name` contains string data, `VBA_var_name` is exported as a MATLAB cell array. Empty string elements within `VBA_var_name` become `NaN`s within the MATLAB cell array.

Input Arguments

`ML_var_name`

Name of MATLAB matrix to create or overwrite.

`ML_var_name` in quotes directly specifies the matrix name. `ML_var_name` without quotes specifies a VBA variable that contains the matrix name as a string.

`VBA_var_name`

Name of VBA variable whose contents are written to `ML_var_name`.

Use `VBA_var_name` without quotes.

Output Arguments

`out`

`0` if the command succeeded. Otherwise, a string containing error code.

Examples

Create a MATLAB Matrix Using Data Stored in a VBA Variable

Create (or overwrite) the MATLAB matrix `K` with the data in the VBA variable `DataK`:

```
Sub Put()
MLPutVar "K", DataK
End Sub
```

See Also

`MLGetVar`

Purpose

Return standard Spreadsheet Link EX errors or full MATLAB errors using `MLEvalString`

Syntax

```
MLShowMatlabErrors(flag)
MLShowMatlabErrors flag
out = MLShowMatlabErrors(flag)
```

Description

`MLShowMatlabErrors(flag)` sets the Spreadsheet Link EX error display mode when executing MATLAB commands using `MLEvalString`. *Use this syntax when working directly in a worksheet.*

`MLShowMatlabErrors flag` sets the Spreadsheet Link EX error display mode when executing MATLAB commands using `MLEvalString`. *Use this syntax in a VBA macro.*

`out = MLShowMatlabErrors(flag)` lets you catch errors when executing `MLShowMatlabErrors` in a VBA macro. If `MLShowMatlabErrors` fails, then `out` is a string containing error code. Otherwise, `out` is `0`.

Input Arguments

`flag`

Either `"yes"` or `"no"`.

Specify `"yes"` to display the full MATLAB error string upon `MLEvalString` failure. Specify `"no"` to display the standard Spreadsheet Link EX errors upon `MLEvalString` failure.

Default: `"no"`

Output Arguments

`out`

`0` if the command succeeded. Otherwise, a string containing error code.

Examples

Switch to Displaying Spreadsheet Link EX Errors

Switch to displaying standard Spreadsheet Link EX errors, such as `#COMMAND`, on `MLEvalString` failures:

```
MLShowMatlabErrors("no")
```

Switch to Displaying MATLAB Errors

Switch to displaying MATLAB error strings, such as `??? Undefined function or variable 'foo'`, on `MLEvalString` failures:

```
MLShowMatlabErrors("yes")
```

See Also

`MLEvalString`

Purpose

Specify MATLAB current working folder after startup

Syntax

```
MLStartDir(path)
MLStartDir path
out = MLStartDir(path)
```

Description

`MLStartDir(path)` sets the MATLAB working folder after startup. *Use this syntax when working directly in a worksheet.*

`MLStartDir path` sets the MATLAB working folder after startup. *Use this syntax in a VBA macro.*

`out = MLStartDir(path)` lets you catch errors when executing `MLStartDir` in a VBA macro. If `MLStartDir` fails, then `out` is a string containing error code. Otherwise, `out` is `0`.

Tips

- This function does not work like the standard Microsoft Windows **Start In** setting, because it does not automatically run `startup.m` or `matlabrc.m` in the specified folder.
- The working folder changes only if you run MATLAB *after* you run this function. Running this function while MATLAB is running does not change the working folder for the current session. In this case, MATLAB uses the specified folder as the working folder when it is restarted.

Input Arguments

`path`

Path to the new MATLAB working folder after startup.

Output Arguments

`out`

`0` if the command succeeded. Otherwise, a string containing error code.

Examples

Specify MATLAB Working Folder

Set the MATLAB working folder to `d:\work` after startup:

```
MLStartDir ( d:\work )
```

Specify MATLAB Working Folder That Includes Spaces

If your folder path includes a space, embed the path in single quotation marks within double quotation marks.

Set the MATLAB working folder to `d:\my work`:

```
MLStartDir ( 'd:\my work' )
```

See Also

`MLAutoStart`

Purpose

Toggle `MLPutMatrix` to use MATLAB cell arrays

Syntax

```
MLUseCellArray(flag)
MLUseCellArray flag
out = MLUseCellArray(flag)
```

Description

`MLUseCellArray(flag)` specifies whether `MLPutMatrix` must use cell arrays for transfer of data (for example, dates). When the Spreadsheet Link EX software is installed, the default is `"no"`. If you change the value of `MLUseCellArray` to `"yes"`, the change remains in effect the next time a Microsoft Excel session starts. *Use this syntax when working directly in a worksheet.*

`MLUseCellArray flag` specifies whether `MLPutMatrix` must use cell arrays for transfer of data. *Use this syntax in a VBA macro.*

`out = MLUseCellArray(flag)` lets you catch errors when executing `MLUseCellArray` in a VBA macro. If `MLUseCellArray` fails, then `out` is a string containing error code. Otherwise, `out` is `0`.

Input Arguments

`flag`

Either `"yes"` or `"no"`.

Specify `"yes"` to automatically uses cell arrays for transfer of data structures. Specify `"no"` to stop using cell arrays for transfer of data structures.

Default: `"no"`

Output Arguments

`out`

`0` if the command succeeded. Otherwise, a string containing error code.

Examples

Stop Using Cell Arrays When Transferring Data Structures

Cancel automatic use of cell arrays for easy transfer of data:

```
MLUseCellArray("no")
```

See Also MLPutMatrix

Purpose

Specify whether to use full MATLAB desktop or MATLAB Command Window

Syntax

```
MLUseFullDesktop(flag)
MLUseFullDesktop flag
out = MLUseFullDesktop(flag)
```

Description

`MLUseFullDesktop(flag)` sets the MATLAB session to start with the full desktop or Command Window only. *Use this syntax when working directly in a worksheet.*

`MLUseFullDesktop flag` sets the MATLAB session to start with the full desktop or Command Window only. *Use this syntax in a VBA macro.*

`out = MLUseFullDesktop(flag)` lets you catch errors when executing `MLUseFullDesktop` in a VBA macro. If `MLUseFullDesktop` fails, then `out` is a string containing error code. Otherwise, `out` is `0`.

Input Arguments

`flag`

Either `"yes"` or `"no"`.

Specify `"yes"` to start full MATLAB desktop. Specify `"no"` to start the MATLAB Command Window only.

Default: `"yes"`

Output Arguments

`out`

`0` if the command succeeded. Otherwise, a string containing error code.

Examples

Start Only the MATLAB Command Window

Set the MATLAB session to start with the command window only:

```
MLUseFullDesktop("no")
```

See Also

`matlabinit | MLClose | MLOpen`

A

Examples

Use this list to find examples in the documentation.

Macro Examples

Financial Examples

Index

L

M

N

P

R

S

T

V

W

Z