UnRiskExcel

1 Prerequisites

- Windows XP or higher
- Microsoft Excel 2003 SP3, 2007 SP2, 2010 (32 or 64-bit) or 2013 (32 or 64-bit)
- Mathematica 8 or higher
- UnRisk 8.0 or higher

2 Installation

To install UnRiskExcel, both Mathematica and Excel must be configured. UnRiskExcel is available in different versions, corresponding to the different versions of Excel. The necessary files are contained in the UnRisk installation directory under UnRisk_for_Excel\AddIn. There are subdirectories for the different Excel versions, see below.

```
| UnRisk
        | UnRisk_for_Excel
                | AddIn
                        | Excel2003
                        | Excel2007
                        | Excel2010-32bit
                        | Excel2010-64bit
                        | Excel2013-32bit
                        | Excel2013-64bit
```

Each folder contains the files UnRiskExcelVBA.xla and UnRiskExcel.xll.

2.1 Mathematica

In the Mathematica front-end, you need to configure the number of parallel kernels. Start Mathematica, select **Evaluation** from the main menu and choose the menu item **Parallel Kernel Configuration**. The dialog shown in Figure 1 will open.

On a single-core system, you won't be able to configure the number of kernels. On multi-core systems, the displayed number of kernels varies with the number of cores. If you can modify the configuration, ensure that the number of local kernels is set to **Automatic**.
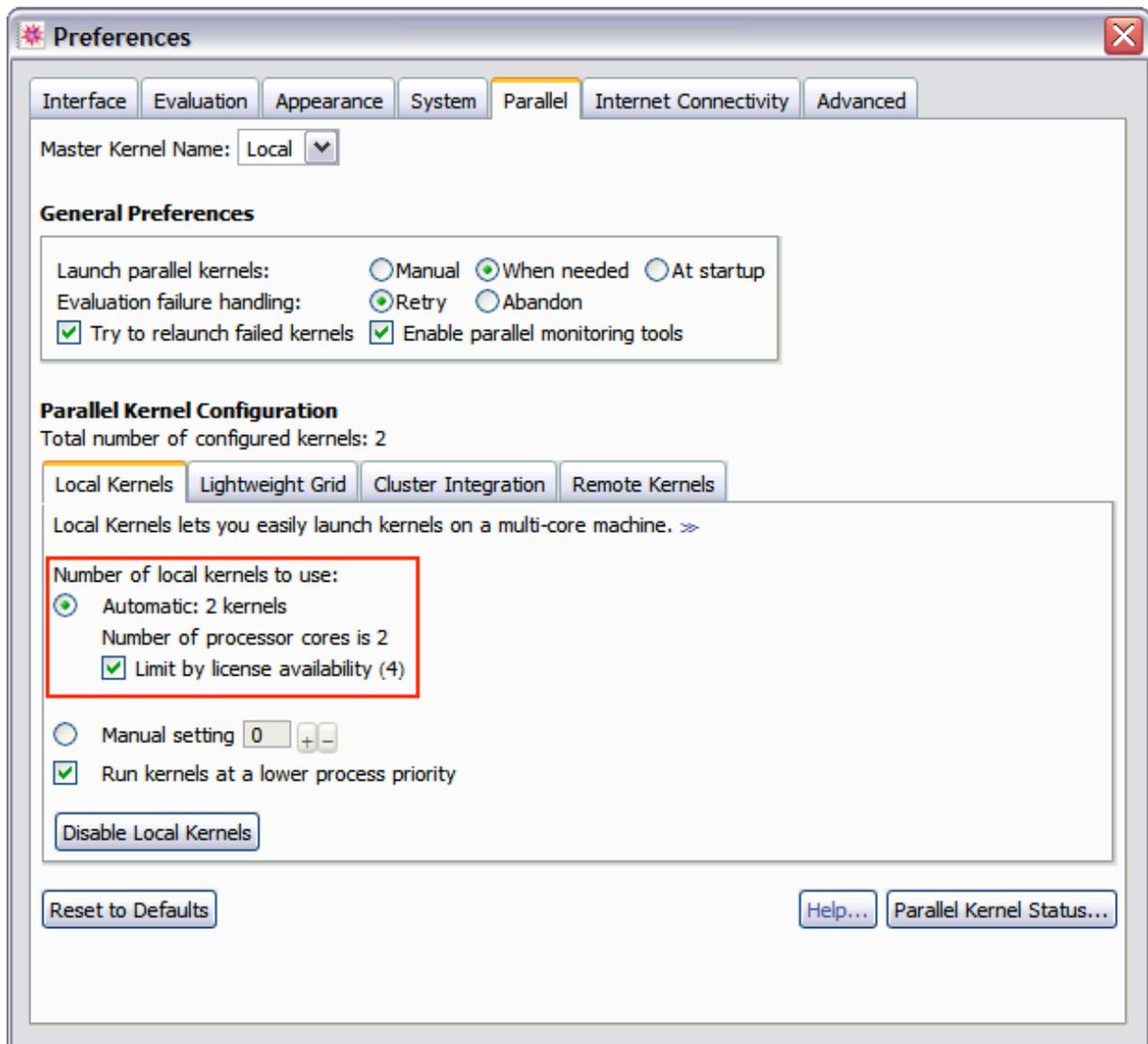
Figure 1: Mathematica parallel kernel configuration dialog

2.2 Excel 2003

Start Excel, and on the **Tools** menu, click **Add-Ins**. Excel will open the Add-Ins dialog. Click **Browse** and locate your UnRisk directory. Select **both** files from the **UnRisk\UnRisk_for_Excel\Excel2003** directory and ensure that both Add-Ins are checked. After installing both UnRiskExcel files, the Add-Ins dialog should look similar to Figure 2.
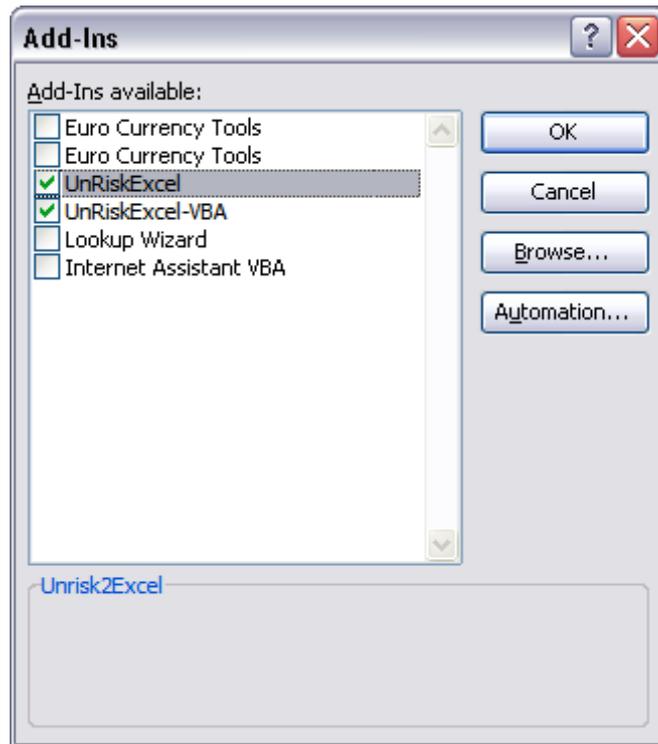
Figure 2: Excel Add-Ins dialog

2.3 Excel 2007

For Excel 2007, Service Pack 2 is required for running UnRiskExcel. Click the **Microsoft Office Button** , and click **Excel Options**. Click at the **Add-Ins** category. In the **Manage** box, select **Excel Add-ins**, and click **Go**.

Click **Browse** and locate your UnRisk directory. Select **both** files from the **UnRisk\UnRisk_for_Excel\Excel2007** directory and ensure that both Add-Ins are checked. After installing both UnRiskExcel files, the Add-Ins dialog should look similar to Figure 2.

Excel 2007 can perform multiple calculations in parallel. To use this feature, it must be configured. Click the **Microsoft Office Button** , and click **Excel Options**. Click at the **Advanced** category and scroll down to the section **Formulas**. Ensure that **Enable multi-threaded calculation** is checked and that **Use all processors on this computer** is selected. Figure 3 shows the dialog with the correct settings applied.
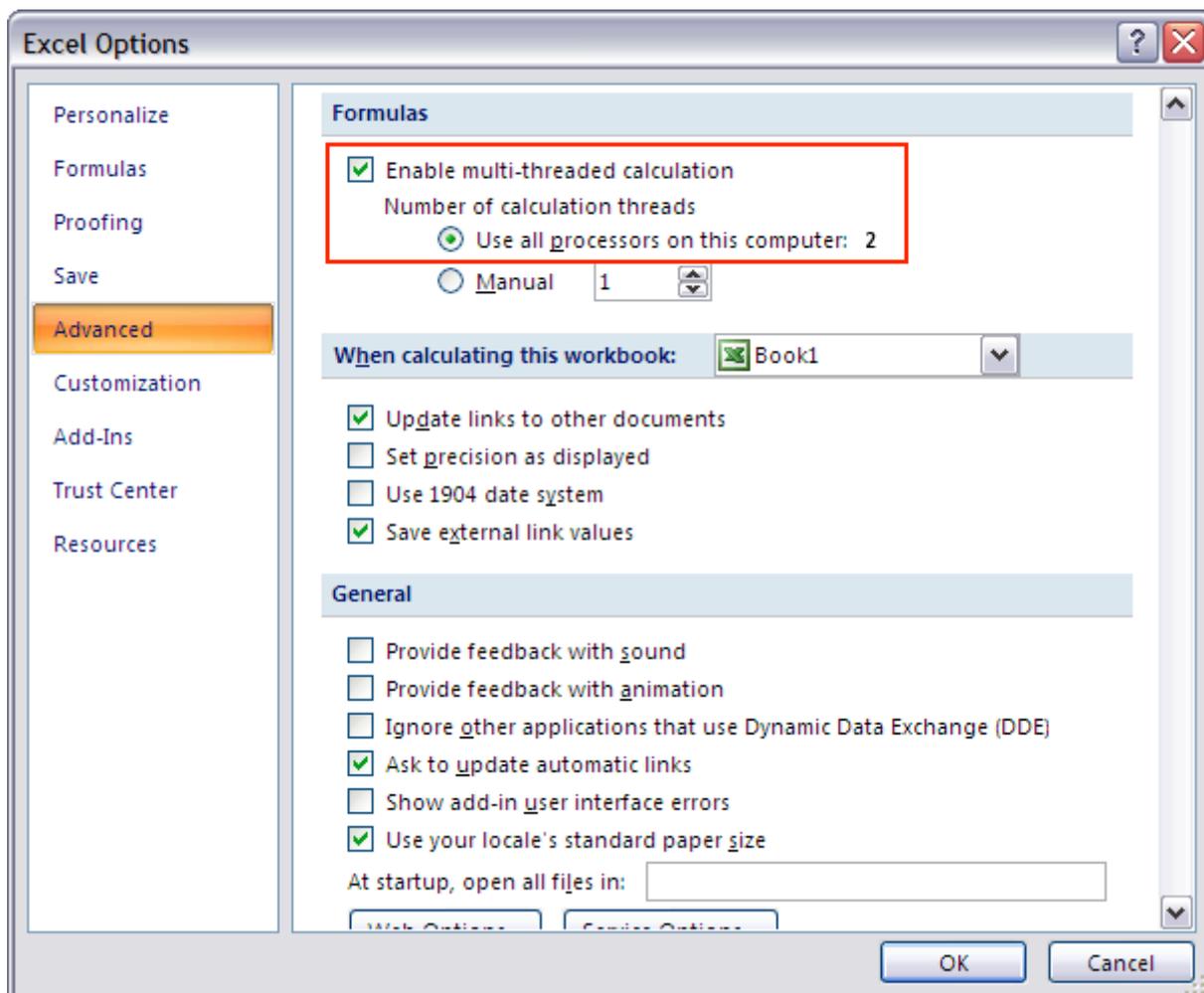
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Figure 3: Dialog for activating multi-threaded calculation

2.4 Excel 2010

To determine if you have Excel 2010 32 or 64-bit installed, click the **File Menu**, and select **Help**. The exact version string is in the area on the right, e.g., Version: 14.0.4760.1000 (32 bit). To install the appropriate UnRiskExcel version, click the **File Menu**, and select **Options**. Click at the **Add-Ins** category. In the **Manage** box, select **Excel Add-ins**, and click **Go**.
Click **Browse** and locate your UnRisk directory. Depending on the version determined earlier, navigate **either** to **UnRisk\UnRisk_for_Excel\Excel2010-32bit or** the **Excel2010-64bit** directory. From the appropriate directory, select **both** files and ensure that both Add-Ins are checked. After that, the Add-Ins dialog should look similar to Figure 2.

Excel 2010 can perform multiple calculations in parallel. To use this feature, it must be configured. Click the **File Menu**, and select **Options**. Click at the **Advanced** category and scroll down to the section **Formulas**. Ensure that **Enable multi-threaded calculation** is checked and that **Use all processors on this computer** is selected. Figure 3 shows the dialog with the correct settings applied.

2.5 Excel 2013

To determine if you have Excel 2013 32 or 64-bit installed, click the **File Menu**, and select **Help**. The exact version string is in the area on the right, e.g., Version: 15.0.4569.1506 (32 bit). To install the appropriate UnRiskExcel version, click the **File Menu**, and select **Options**. Click at the **Add-Ins** category. In the **Manage** box, select **Excel Add-ins**, and click **Go**.

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Click **Browse** and locate your UnRisk directory. Depending on the version determined earlier, navigate **either** to **UnRisk\UnRisk_for_Excel\Excel2013-32bit or** the **Excel2013-64bit** directory. From the appropriate directory, select **both** files and ensure that both Add-Ins are checked. After that, the Add-Ins dialog should look similar to Figure 2.

Excel 2013 can perform multiple calculations in parallel. To use this feature, it must be configured. Click the **File Menu**, and select **Options**. Click at the **Advanced** category and scroll down to the section **Formulas**. Ensure that **Enable multi-threaded calculation** is checked and that **Use all processors on this computer** is selected. Figure 3 shows the dialog with the correct settings applied.

3 Updating UnRiskExcel

If you are already using UnRiskExcel and if you only want to update UnRiskExcel without updating your UnRisk installation, perform the following steps:

1. Close **all** Excel windows and **exit** Excel.
2. Locate your UnRisk installation directory and extract UnRiskExcel to **UnRisk\UnRisk_for_Excel.** Overwrite already existing files.

   Excel 2003: Start Excel, and on the **Tools** menu, click **Add-Ins.** Uncheck **both** UnRiskExcel Add-Ins

   Excel 2007: Click the **Microsoft Office Button** , and click **Excel Options**. Click at the **Add-Ins** category. In the **Manage** box, select **Excel Add-ins**, and click **Go**. Uncheck **both** UnRiskExcel Add-Ins.

   Excel 2010: Click the **File Menu**, and select **Options**. Click at the **Add-Ins** category. In the **Manage** box, select **Excel Add-ins**, and click **Go**. Uncheck **both** UnRiskExcel Add-Ins.

   Excel 2013: Click the **File Menu**, and select **Options**. Click at the **Add-Ins** category. In the **Manage** box, select **Excel Add-ins**, and click **Go**. Uncheck **both** UnRiskExcel Add-Ins.
3. Close **all** Excel windows and **exit** Excel
4. Restart Excel and perform the normal installation steps (see Section Installation). During the installation, Excel might ask if the new Add-Ins should replace the existing ones. Choose **Yes**.

During the first Excel startup after updating UnRiskExcel might display a warning message to indicate that your configuration file was corrected. This message is normal.

4 Upgrading Excel

To upgrade to a more recent version of Excel (e.g., to upgrade from Excel 2003 to Excel 2010), please first follow the steps for installing the UnRisk Add-In for your new version of Excel, see sections 2.2, 2.3 and 2.4 in this guide.

As Excel saves the full path to an Add-In also in workbook formulas that use it, your UnRiskExcel workbooks need to be updated, too. You do not need to do this by hand: To update all formulas in a workbook to use the new Add-In, please run "Convert Current Workbook" from the Add-Ins->UnRisk menu. You can also batch-convert all workbooks in a directory on your computer with "Add-Ins->UnRisk->Convert Workbooks…".

5 Usage

5.1 First Startup

UnRiskExcel tries to locate an existing Mathematica installation automatically, so that the Mathematica installation directory needs not to be configured. Only if UnRiskExcel fails to locate the Mathematica installation, the user must configure the directory manually. For details see Section Configuration File.

UnRiskExcel registers the new Excel function **UnRisk** that is used to invoke UnRisk calculations. It also adds a new menu **UnRisk** to the main menu bar. UnRiskExcel replaces the previously used "Mathematica Link for Excel" and provides an automatic workbook

conversion that can be executed from the UnRisk menu. After converting the workbooks, "Mathematica Link for Excel" can be uninstalled if no longer required.

5.2 Parallelization

Normally, calculations are performed one by one but many of nowadays computers can perform multiple calculations in parallel. UnRiskExcel provides parallel calculation support if it detects that your computer is capable of performing multiple calculations in parallel. This is especially efficient for long running calculations and can severely reduce the time required for calculation.

- For **Excel 2003**, UnRiskExcel provides multiple commands that allow parallel calculation of UnRisk formulas within the current workbook, the active sheet or the active selection. However, there is the following limitation:
  - *Calculate Workbook in Parallel:* UnRiskExcel iterates over all worksheets, from **left to right** and calculates each worksheet **separately**. So, the user must ensure that formulas **never** reference worksheets to their right. Otherwise, old values might be used.
- **Excel 2007** natively performs multiple calculations in parallel. However, Excel 2007 has one limitation:
  - *Formulas using* `INDIRECT`: If a formula uses the worksheet formula `INDIRECT`, Excel cannot parallelize the calculation.
- **Excel 2010** natively performs multiple calculations in parallel without any known limitations.
- **Excel 2013** natively performs multiple calculations in parallel without any known limitations.

5.3 Features

UnRiskExcel adds a menu **UnRisk** to Excel's main menu and provides the following commands:

- **Start/Stop UnRisk:** Starts or stops UnRisk. All calculations that are currently in progress are aborted when UnRisk is shutdown.
- **Convert Current Workbook:** Converts the active workbook from "Mathematica Link for Excel" to UnRiskExcel. All Math(…) and UnRisk(…) functions within Excel formulas are converted to UnRisk(…). After successful conversion of the workbook, it must be recalculated.
  There is one limitation in this conversion: long array formulas (more than 255 characters) cannot be converted automatically, due to a limitation of Excel.
- **Convert Workbooks:** This opens a conversion dialog that allows the user to efficiently convert lots of workbooks to UnRiskExcel.
- **Edit Configuration:** Opens the configuration file and allows customization of the settings. See Section Configuration File for details.
- **Clear Cache:** UnRiskExcel stores previously calculated results internally. Whenever an UnRisk calculation is encounter that was already calculated before, the result can be directly obtained from the pool of cached calculations to avoid unnecessary recalculations. When clicking this menu item all cached calculation results are cleared. This forces the recalculation of subsequent UnRisk calculations.
- **Open Logfile:** Opens the UnRiskExcel log file, where error messages are written to.

The following menu items provide the UnRiskExcel parallelization feature and are only visible in Excel 2003:

- **Calculate Workbook in Parallel:** This activates the UnRiskExcel parallelization feature and calculates the active workbook. It is similar to using Excel's keyboard shortcut **F9**, but calculates the current workbook using parallelization. UnRiskExcel

iterates over all worksheets, from **left to right** and calculates each worksheet **separately**. Therefore, the user must ensure that formulas **never** reference worksheets to their right. Otherwise, old values might be used.

- **Calculate Sheet in Parallel:** This activates the UnRiskExcel parallelization feature and calculates the active worksheet. This command can be used instead of the Excel keyboard shortcut **Shift + F9**.
- **Calculate Selection in Parallel:** This activates the UnRiskExcel parallelization feature and calculates the current selection.

The following menu items are only visible if "Excel comment" was chosen as the error reporting mode in the configuration file:

- **Show Error Comments:** It displays all errors that have occurred as Excel comments that are attached to the erroneous cell. Previously attached comments will be overwritten.
- **Clear Error Comments:** This deletes all currently displayed error comments.

Long running calculations can always be aborted by pressing the escape button (ESC).

6 Configuration File

The configuration file exists per user and contains the following options:

- **Error reporting:**
  - *Messagebox:* When an error occurs, a message box is displayed to the user. This interrupts further calculations until the message box is closed.
  - *Log file:* Errors are not reported explicitly and are only logged in the log file.
  - *Excel comments:* Allows the user to display error messages as Excel comments that are attached to the erroneous cell. If this option is selected, Excel displays the UnRiskExcel menu commands **Show** and **Clear** Error Comments.
- **Automatic UnRisk startup:** If this option is enabled, UnRisk will start automatically when an UnRisk calculation is performed.
- **Mathematica installation directory:** You can explicitly configure the Mathematica installation directory.
- **Mathematica packages:** This option determines which Mathematica packages are loaded when UnRiskExcel starts.
- **Logfile directory:** Per default, the logfiles are placed in "C:\Documents and Settings\Username\Application Data\UnRiskExcel\LogFiles\". This location can be customized.
- **Log level:** This option determines how many details are written to the log files. Normally, it should not be necessary to change this value.
- **Show "Calculate Workbook in Parallel" message:** If this option is enabled, UnRiskExcel displays a warning whenever "Calculate Workbook in Parallel" is used. This warning mentions all limitations of "Calculate Workbook in Parallel".
- **Number of stored calculation results:** UnRiskExcel stores previously calculated results internally. Whenever an UnRisk calculation is encountered that was already calculated before, the result can be directly obtained from the pool of cached calculations to avoid unnecessary recalculations. The number of cached calculations determines how many UnRisk calculations are cached by UnRiskExcel. A high number increases the memory usage but speeds up calculations. Set this value to zero, if UnRiskExcel must not store calculation results.

Where this file is located, depends on the Version of Microsoft Windows:

- **Windows XP / Windows Server 2003**

C:\Documents and Settings\Username\Application Data\UnRiskExcel
- **Windows Vista / Windows 7 / Windows 8 / Windows Server 2008**
  C:\Users\ Username\AppData\Roaming\UnRiskExcel

This folder also contains the UnRiskExcel log files. If an error occurs while using UnRiskExcel, it is logged there.

7 Visual Basic

All UnRiskExcel commands that are available in the UnRisk menu can also be executed by Visual Basic for Applications (VBA). For this, UnRiskExcelVBA must be added to the references of your VBA project. Open the Excel VBA editor and on the **Tools** menu, click **References**. In the following dialog, check UnRiskExcelVBA.
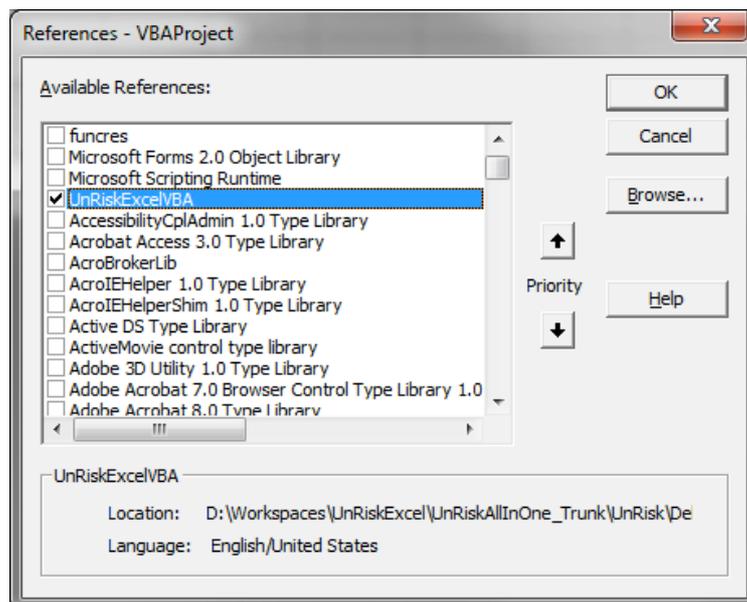
Figure 4: Dialog for adding the reference to UnRiskExcelVBA

The following UnRisk functions can be invoked by VBA code:

```
Function UnRiskStartStop(ByVal start As Boolean) As Boolean
Function UnRiskCalculateWorkbookInParallel() As Boolean
Function UnRiskCalculateSheetInParallel() As Boolean
Function UnRiskCalculateSelectionInParallel() As Boolean
Function UnRiskConvertWorkbook() As Boolean
Function UnRiskEditConfig() As Boolean
Function UnRiskOpenLog() As Boolean
Function UnRiskShowErrorComments() As Boolean
Function UnRiskClearErrorComments() As Boolean
Function UnRiskClearStoredCalculationResults() As Boolean
```

Every function returns `True` if it was executed successfully and `False` otherwise.
For all functions that take the Boolean value `start` as their parameter, `start` determines if the corresponding action should be started or stopped. `UnRiskStartStop(True)` for example starts UnRisk, while `UnRiskStartStop(False)` stops it.
The functions `UnRiskShowErrorComments()` and `UnRiskClearErrorComments()` only perform an action if error reporting was set to **Excel Comments** in the configuration file.

The following code example starts UnRisk and computes the workbook using UnRisk parallelization. When the calculations are finished, UnRisk is stopped.

```
Sub RecalcWorkbook()
    On Error GoTo ErrorHandler

    Call UnRiskStartStop(True)
    Call UnRiskCalculateWorkbookInParallel
    Call UnRiskStartStop(False)
    Exit Sub

    ErrorHandler:
        MsgBox (Err.Description)
End Sub
```

8 Frequently Asked Questions

Question: After updating UnRiskExcel, a warning message is displayed that my configuration file was corrected. Was there a problem with my configuration file?
Answer: This message is normal and may occur after updating UnRiskExcel if configuration options were added in the new UnRiskExcel version. The values of all existing configuration options are preserved when updating UnRiskExcel. For new configuration options, default values are added to your configuration file.

Question: All UnRisk formulas in my Excel workbook have the value #NAME? How can I fix this?
Answer: Just run "Convert Current Workbook" from the UnRisk menu. When the conversion has finished, you can recalculate the workbook.

Question: Why are the menu items *Calculate Workbook in Parallel, Calculate Sheet in Parallel* and *Calculate Selection in Parallel* not visible?
Answer: Your computer does not support parallel calculations.

Question: I'm calling a Mathematica function with string arguments. Why does Mathematica complain that my arguments are symbols instead of string values?
Answer: UnRiskExcel always tries to convert strings to Mathematica expressions. This has the advantage that you can directly evaluate complex Mathematica expressions in Excel. To force that a string value is passed, either put the value in *quotes ("stringValue")* or apply the function *ToString[]*.