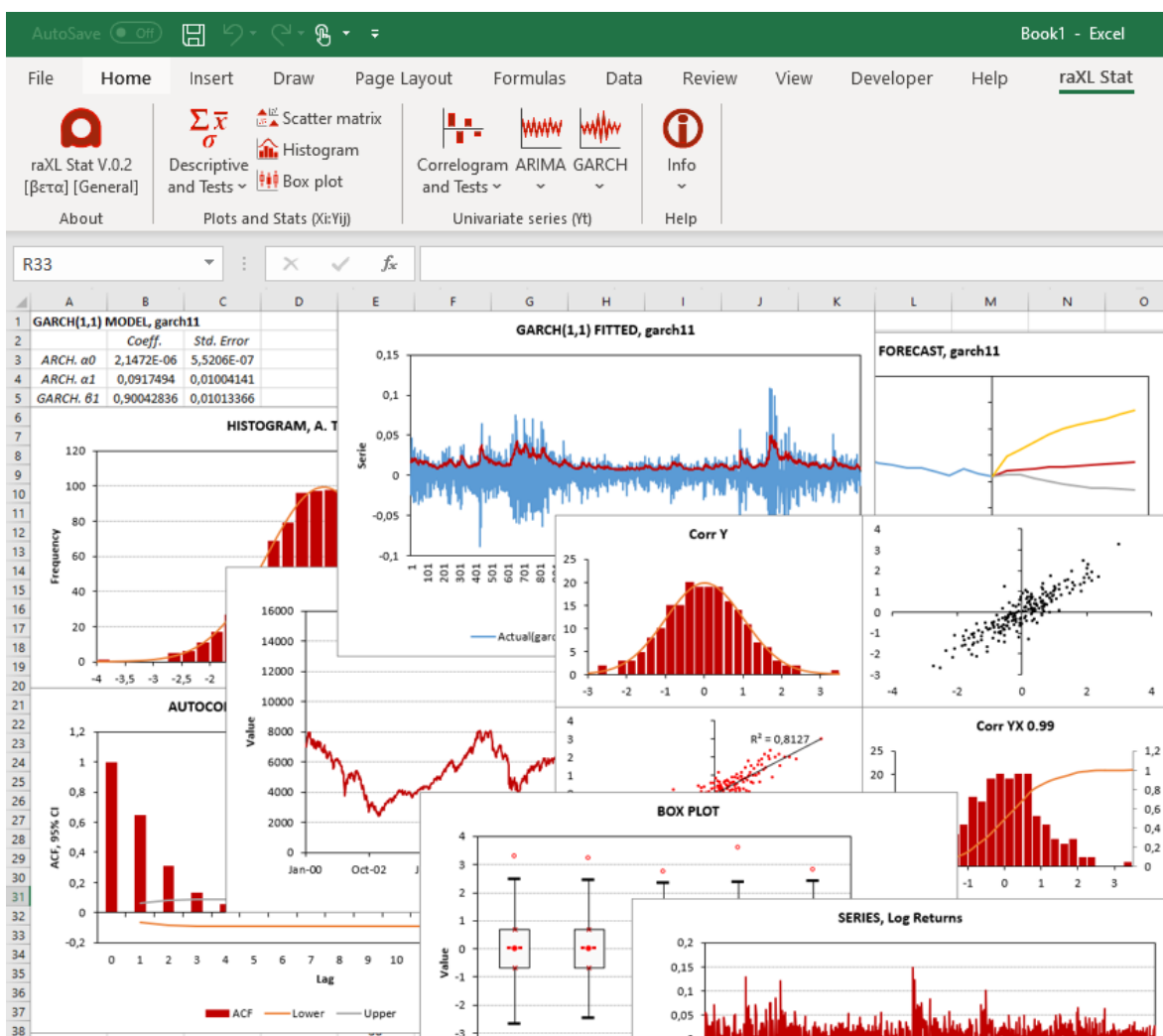




raXL Stat V.0.2 [βετα]

Statistical Add-in for Data Science in Excel

User manual



La Paz, October 2024

Doc. Version V.0.2



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Preface and Disclaimer

raXL Stat is a statistical add-in for Data Science for Microsoft Excel¹.

This Getting Started Guide aims to guide you through the usage process to give you an overview of the raXL Stat menu and functions. The information contained herein is not error-free and is subject to change without notice. If you find any errors, please let us know.

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For more information, please visit <https://ruben-apaza.blogspot.com/p/raxl-stat.html> or you can contact rubenfapaza@gmail.com.

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raXL Management (hereinafter "Administration") grants client's permission to use this plugin in accordance with the software terms of use below.

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(1) The Administration does not offer any warranty or compensation regarding this software. Therefore, any problems arising with this plugin will be handled at the customer's own expense and responsibility.

(2) If you only use the Trial version functions of this software, technical support may not be provided.

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Article 3 Termination of the contract

(1) If the Customer is unable to comply with all provisions contained in these Terms of Use, the contract based on these Terms of Use shall be terminated immediately without notice from the Administration.

(2) In the case of the preceding paragraph, the Administration will not refund the usage fee to the customer.



1. Introduction

raXL Stat is an add-in for Microsoft Excel that turns your favorite spreadsheet into a quantitative and predictive analysis software, offering a collection of functions for creating statistical, econometric, and mathematical models. You can call these functions directly from a spreadsheet and they will return the modeling results directly to it.

raXL Stat is a statistical analysis software that will offer² easy-to-use tools to perform and deliver quality work in a short time. It is developed³ for use by both beginners and experts. The easiest and most intuitive way to execute the functions is through the ribbon menu. If necessary, the user can directly write the functions in the spreadsheet cells or can invoke the functions from VBA (Visual Basic for Excel) programming. Application).

A feature of raXL Stat is a no-install, portable . xll file, seamlessly integrates with Excel with new User Defined Functions (UDFs), automated charting, a rich set of shortcuts, and an intuitive user interface. It integrates with the version of Excel you have installed on your Personal Computer (PC), not the Windows version.

With the raXL plugin Stat v.0 [Beta] you can do the following:

- Calculate and graph the Autocorrelation Function (ACF).
- Calculate and graph the Partial Autocorrelation Function (PACF).
- Perform the White Noise test and independence with the Ljung -Box or Box-Pierce test.
- Perform the Unit Root and Stationarity test with the Augmented Dickey -Fuller (ADF) or Kwiatkowski -Phillips-Schmidt- Shin (KPSS) test.
- Calculate the coefficients, estimate, forecast and graph the ARIMA(p,d,q) models, that is, AR(p), MA(q) and ARMA(p,q).
- Calculate the coefficients, estimate, forecast and graph the ARCH(p) and GARCH(p,q) models.
- Create a table of ranges (Bins) and frequencies to graph Histograms with a cumulative curve or the normal curve.
- Create a table of quartiles to graph the box plot with outliers.
- Perform the Normality test with the Shapiro-Wilk, Anderson-Darling and Jarque-Bera tests.
- Create a table with Descriptive Statistics with a normality test.
- Create a table with a Covariance matrix and a Classification Coefficient matrix with the options of coefficients of determination (R^2) or a test that there is no correlation ($R=0$).
- Count missing, blank or lost data in a data range.
- Create the Matrix Scatter graph.

²raXL Stat version v.0 [Beta] is a test version to which new public functions will be added to the existing 30.

³Acknowledgment: raXL Stat uses Excel-DNA: Copyright (c) 2024 Govert van Drimmelen.

- Version 0.2 has more than 50 complementary public User-Defined Functions (UPF).

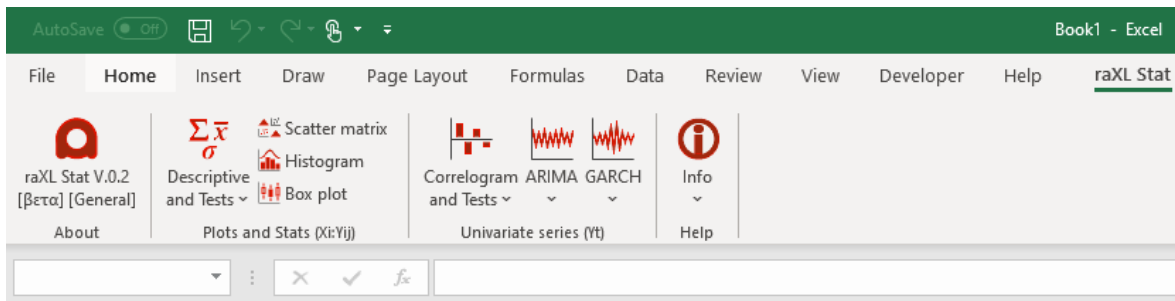


Figure 1

2. Download and use

In summary, as the add-in does not require installation, download the raXLStat.zip file⁴ (<https://ruben-apaza.blogspot.com/p/raxl-stat.html>) Trial or Licensed, unzip the .zip and open the .xll add-in (Figure 2) according to the Excel 32 or 64 bit and click on "Enable this add-in only for this session" (Figure 5). If it does not open or does not appear in the Excel ribbon menu, unlock it by right-clicking on the .xll add-in in properties and their check unlock and accept, and again open the .xll and it will appear in the Excel ribbon menu "raXL Stat" for use (Figure 6).

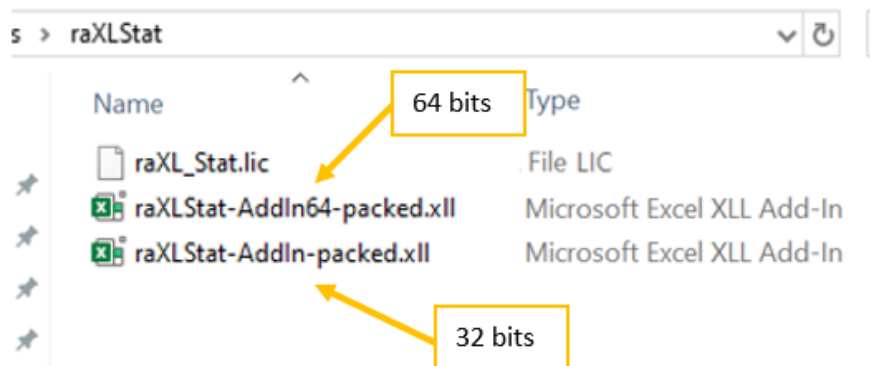


Figure 2

However, below are step-by-step instructions on how to download and use the plugin.

2.1 License and 30-day trial

raXL_Stat.lic license is provided in the raXLStat.zip file upon purchase (Figure 2) this .lic file must go together with the .xll plugin, it is annual and generic, if you have any problems with the license, want to customize or buy only the raXL_Stat.lic license you can contact rubenfapaza@gmail.com.

⁴ The file contains: "raXLStat-AddIn-packed.xll" and "raXLStat-AddIn64-packed.xll", if you have purchased the license it will include the "raXL_Stat.lic" license, in the Trial version it includes a "Getting Started Guide" manual.



If you purchased only the license you must copy or extract it to the folder where the .xll plugin is located. The license in the Trial or 30-day Trial version is automatically activated.

2.2. System Requirements

raXL Stat is an add-in that integrates with Excel installed on Window 7 or later. Therefore, before using it, you need to have a working version of Microsoft Excel on your PC. It requires Microsoft Excel to be installed, at least, version 2010. It works on both 32-bit and 64-bit Excel systems. In addition to Excel, you need the "Microsoft .NET Framework 4.5.2" or later, installed by default on Windows, but it can be obtained for free via the official Microsoft website⁵.

2.3. Excel version

raXL Stat should be used for the version of Excel you have installed on your Personal Computer (PC), not the Windows version. See the instructions below if you are not sure whether you have the 32-bit or 64-bit version of Excel installed.

The method to know if you have 32-bit or 64-bit Excel depends on the version of Excel you are using:

- Excel 2010: Select File, then Help. On the right side, look for "About Microsoft Excel." Just below that, you'll see the version and in parentheses, "32-bit" or "64-bit."
- Office 365 or Excel 2021, 2019, 2016, 2013: Follow the step-by-step instructions below.

If you already know which version of Excel you have, download the .zip file for either the 30-day trial version or purchase the license. Otherwise, follow the instructions below to find out which version of Excel you have installed:

1. Click the **File** tab in open Excel.
2. Then click on **Account** which is in the bottom left corner.
3. On the right side of the window, you should see an **About Excel** button.
4. Click here and you should see, on the top line, either the 32-bit or 64-bit version of Excel is installed.

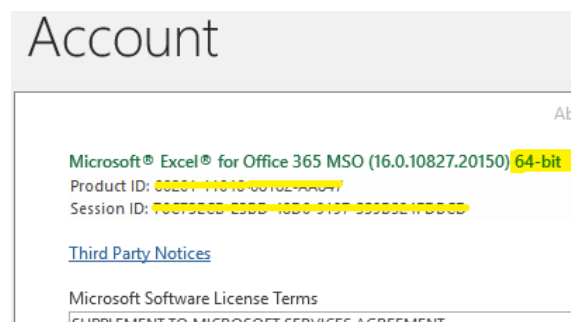


Figure 3

⁵The raXL Stat v.0[Beta] version is developed on .NET Framework 4.7.2, which and other versions can be downloaded at <https://dotnet.microsoft.com/en-us/download/dotnet-framework/net472>

5. Now download the raXLStat.zip file to use the appropriate version of raXL Stat 32-bit or 64-bit (Figure 2).

2. 4. Download and use the plugin

To use raXL Stat, below is a description of how to download and use the plugin:

1. Download the file raXLStat.zip (<https://ruben-apaza.blogspot.com/p/raxl-stat.html>) Trial or licensed.
2. Unzip the downloaded raXLStat.zip file to a visible location, such as your desktop or wherever you can easily locate it. In the unzipped folder (Figure 2) you will find two .xll plugins for 32-bit or 64-bit versions plus the raXL_Stat.lic license. In the Trial version, the 30-day trial license is automatically activated.
3. In the unzipped folder, Unblock the .xll add-on (Figure 2) from Windows Explorer⁶, that is, right-click on the add-on and go to properties (Figure 4) and from there check the unblock check and then Apply and OK.

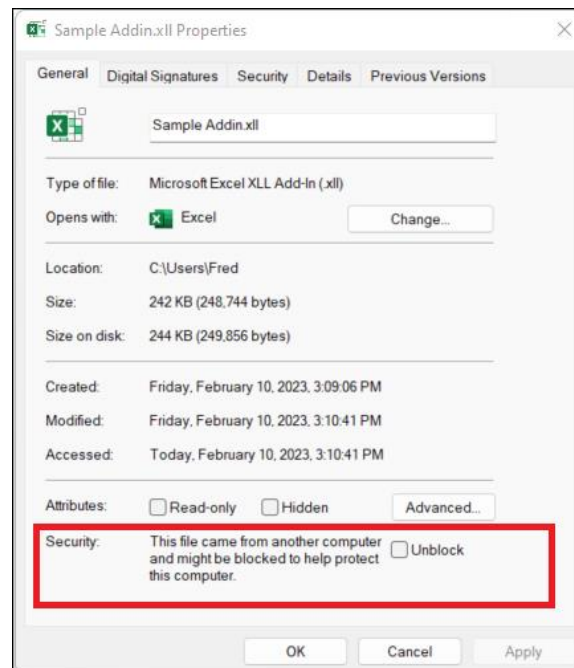


Figure 4

4. Once Unlocked, open the add-in " raXLStat-AddIn-packed.xll " or " raXLStat-AddIn64-packed.xll " (Figure 2) depending on the 32-bit or 64-bit Excel installed on your PC, by double-clicking on it or through Excel's File and Open menu.
5. When you open it, the "Microsoft Excel Security Notice" window will appear, and you must click on "Enable this add-in for this session only" (Figure 5).

⁶As with any Excel file with Macros downloaded from the Internet such as .xlsx .xlsm .xlam, Microsoft blocks .xll add-ins downloaded from the Internet by default.

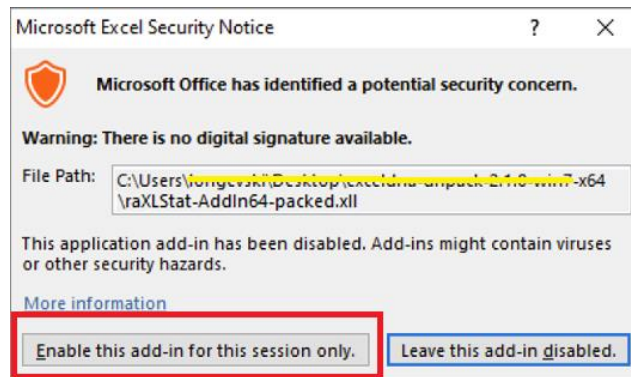


Figure 5

3. Functionalities

raXL Stat functions can be applied in three different ways, for more details you can check and watch the list of videos about the use of raXL Stat on our YouTube channel:

https://www.youtube.com/watch?v=wYdGCKdN6cE&list=PLu4ltjreHhzO-cV1rHlis-K5_8numRqQV&pp=gAQBiAQB.

3.1. From the Menu

raXL Stat's Excel ribbon menu is the easiest way to run Functions. Select the desired operation and then fill in the form from the menu. When you press the Ok button, the syntax check is run before calling the actual functions contained in the .xll plugin (Figure 2). In addition, you have the options of Main, Options and Forecast.

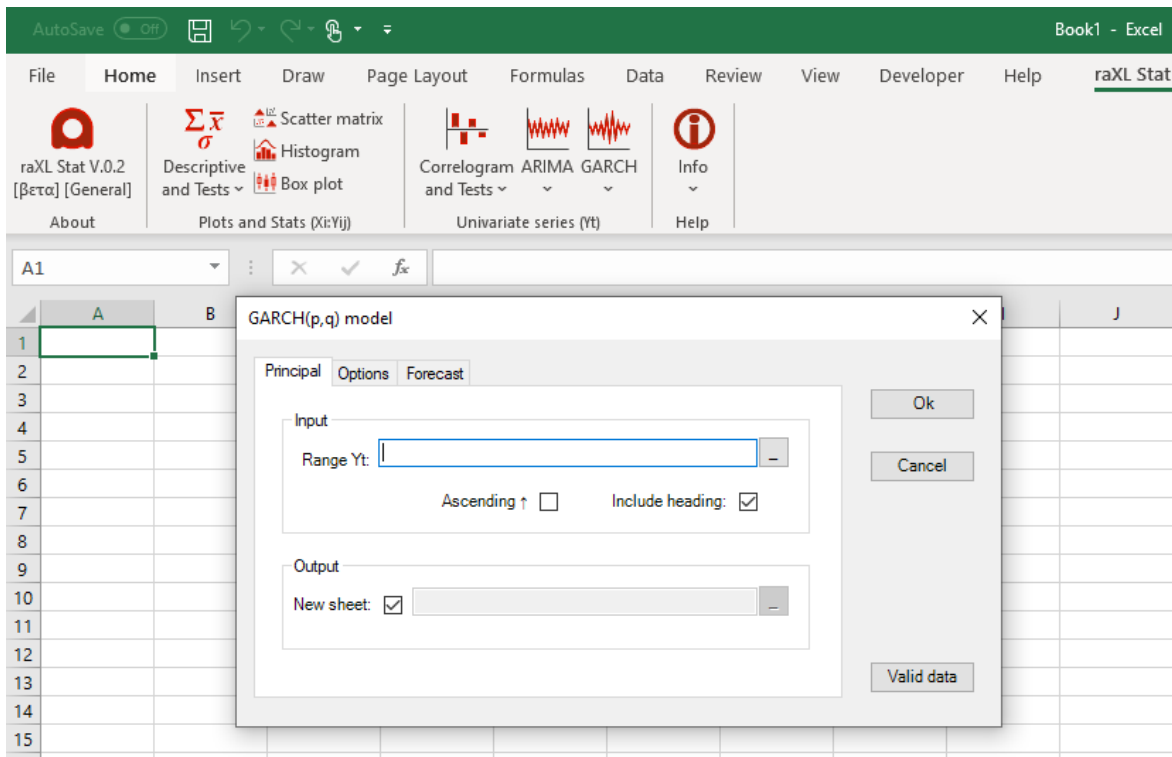


Figure 6

3.2. Insert function

Typing functions manually into spreadsheet cells: In this case, the user must make sure to follow the correct syntax. Incorrect syntax will cause incorrect results, "#NUM!", Excel errors, or simply the zero value "0". Also, it is very important to remember that in many cases the returned value of a function can be a vector or a matrix. In those cases, the function must be executed as a multi-cell array formula by pressing the CTRL+SHIFT+ENTER key combination, however, for Excel 365 or 2024 it is not required because it has dynamic array execution.

For more details see section [4. List of functions](#)

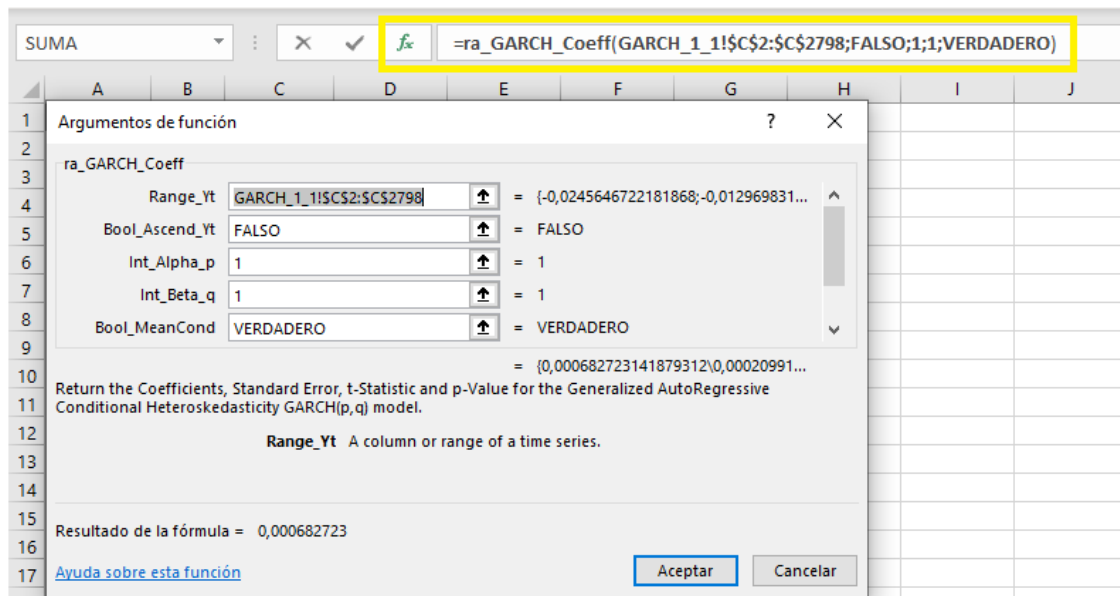


Figure 7

3.3. Function from VBA

Called from an Excel VBA Macro, use the VBA Application.Run method.

```
Option Explicit
Option Base 1
Function Func_GARCHCoeff () As Variant
Application.Calculation = xlCalculationManual
Dim runResult As Variant
Dim result() As Double
Dim rngRange As Range
Dim boolAscend As Boolean
Dim intP As Integer
Dim intQ As Integer
Dim intMuCond As Boolean
Dim i As Integer
Set rngRange = ActiveSheet.Range("B2:B1001")
boolAscend = False
intP = 1
intQ = 1
intMuCond = False
ReDim result(intP + intQ + 1, 1)
runResult = Application.Run("ra_GARCH_Coeff", rngRange, boolAscend, intP, intQ, intMuCond)
For i = 1 To intP + intQ + 1
result(i, 1) = runResult(i, 1)
Next i
Func_GARCHCoeff = result
Application.Calculation = xlCalculationAutomatic
End Function
```

Figure 8

raXL Stat functions or from the VBA editor run as a Macro function by programming, for example (Figure 9) creating a new function "Function" called "RunGARCHCoeff" with the raXL Stat function "ra_GARCH_Coeff" and run from an Excel cell or by creating a Macro "Sub" to run with a Button from Excel. You can also see to use [A. VBA Macro with Button](#).

4. List of functions

raXL Stat features is provided on the following pages, most functions can be shown as an example through the Excel ribbon menu (Figure 6). The function is called by typing in a cell "=" or by pressing on "insert function" (Figure 8) by unfolding in "raXL Stat Add-in to complete the required arguments of the function.

4.1. Data preparation

Generally, when modeling data in time series, it is most common to show dates and values in columns (Ascending-Descending) in the same Excel sheet. Although the time or date is not necessary for modeling, it gives us a general idea about the chronological order of the data. To flip the data in the sheet you can use the function [ra_Range_Flip\(\)](#)

Ascending (↑)				Descending (↓)			
It means that the data is in ascending order, that is, with the most recent date at the top of the sheet (The first value corresponds to the last or recent observation).				It means that the data is in Descending order, that is, with the most recent date at the bottom of the sheet (The first value corresponds to the first or initial observation).			
	A	B	C		A	B	C
1	Date t	Data Yt	Log Yt	1	Date t	Data Yt	Log Yt
2	05-dic-20			2	25-ene-20		
3	04-dic-20			3	26-ene-20		
4	03-dic-20			4	27-ene-20		
5	02-dic-20			5	28-ene-20		
6	01-dic-20			6	29-ene-20		
7	30-nov-20			7	30-ene-20		
8	29-nov-20			8	31-ene-20		
9	28-nov-20			9	01-feb-20		
10	27-nov-20			10	02-feb-20		
11	26-nov-20			11	03-feb-20		
12	25-nov-20			12	04-feb-20		
13	24-nov-20			13	05-feb-20		

4.2. Functions

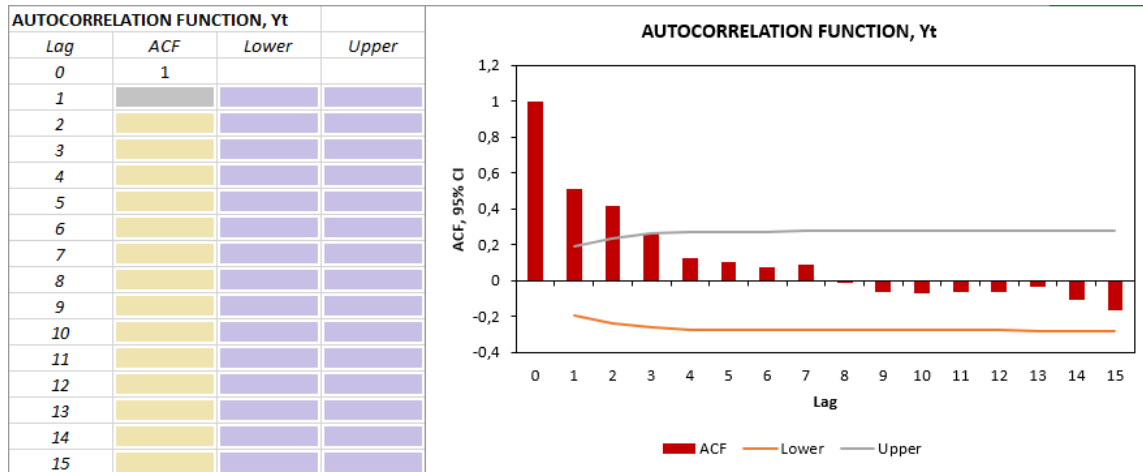
The function can be a value, vector, or matrix. In the case of a matrix, the function is executed by pressing the key combination CTRL+SHIFT+ENTER, however, for Excel Microsoft 365 or Excel 2024 it is not required because it has dynamic matrix execution.

ra_AutoCorr_ACF(range_Yt, int_Lag)

Returns the AutoCorrelation Function at lag k, ACF(k), for a time series in range Yt.

$$FAC(k) = \rho_k = Cov(Y_t, Y_{t-k}) / Var(Y_t)$$

- **range_Yt**, A column or range of a time series.
- **int_Lag**, Positive integer value (≥ 0).



ra_AutoCorr_ACF_Test(range_Yt, int_MaxLag)

Returns the significance test for the autocorrelation function ACF, z-Stat and p-Value of a time series in the range Yt .

- **range_Yt**, A column or range of a time series.
- **int_MaxLag**, Positive integer value (≥ 0).

ra_AutoCorr_ACF_CI(range_Yt, int_MaxLag)

Returns the Confidence Interval (CI) of the autocorrelation function (ACF) of a time series in the range Yt .

- **range_Yt**, A column or range of a time series.
- **int_MaxLag**, Positive integer value (≥ 0).

ra_AutoCoVar_ACVF(range_Yt, int_Lag)

Returns the value of the AutoCoVariance Function (ACVF(k) * (Obs-1)) of a time series in the range Yt

- **range_Yt**, A column or range of a time series.
- **int_Lag**, Positive integer value (≥ 0).

ra_AutoCoVar_ACVF_Matrix(range_Yt, int_MaxLag)

Returns the AutoCoVariance Function (ACVF(k)) matrix of a time series in the range Yt .

- **range_Yt**, A column or range of a time series.
- **int_MaxLag**, Positive integer value ($\geq 0+1$).

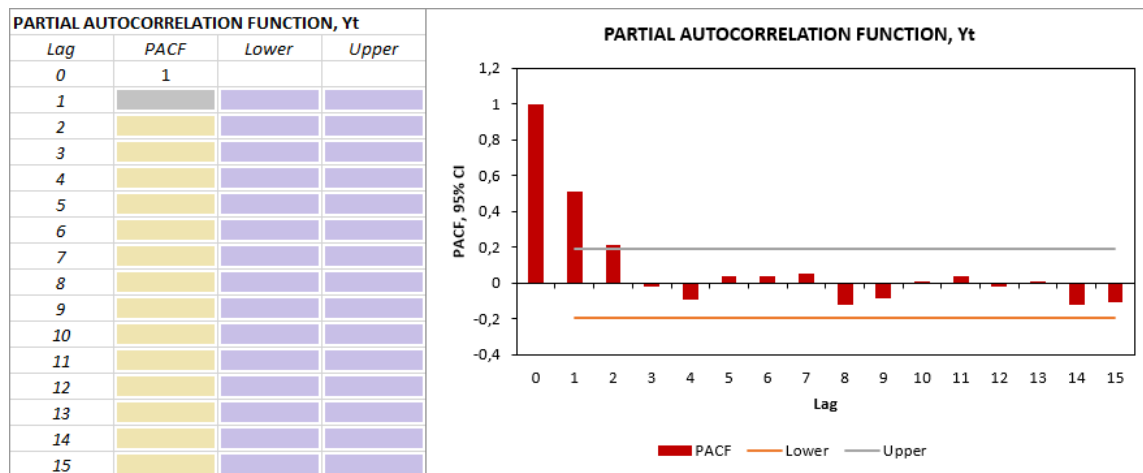
$$\begin{bmatrix} \text{var}(Y_t) & \cdots & \text{Cov}(Y_t, Y_{t-k}) \\ \vdots & \ddots & \vdots \\ \text{Cov}(Y_t, Y_{t-k}) & \cdots & \text{var}(Y_t) \end{bmatrix}$$

ra_Partial_AutoCorr_PACF(range_Yt, int_Lag)

AutoCorrelation Function at lag k, FACP(k), for the time series in range Yt .

$$FACP(k) = \text{Corr}(Y_t, Y_{t-k} | Y_{t-1}, Y_{t-2}, \dots, Y_{t-k-1})$$

- **range_Yt**, A column or range of a time series.
- **int_Lag**, Positive integer value (≥ 0).



ra_Partial_AutoCorr_PACF_CI(range_Yt, int_MaxLag)

Returns the Confidence Interval (CI) of the partial autocorrelation function (PACF) of a time series in the range Yt .

- **range_Yt**, A column or range of a time series.
- **int_MaxLag**, Positive integer value (≥ 0).

ra_LjungBox_Test(range_Yt, int_Lag, bool_ACF)

Returns the Q- Stat and p- Values of the Ljung -Box test of a time series in the range Yt .

$$Ljung - Box(Q) = n(n+2) \sum_{j=1}^m \frac{\rho_j^2}{n-j} \sim \chi^2(m)$$

- **range_Yt**, A column or range of a time series.
- **int_Lag**, Positive integer (≥ 0).
- **bool_ACF**, If TRUE is for ACF, if FALSE is for PACF.



LJUNG-BOX TEST, ACF, Yt		
Lag	Q-Stat	p-Value
0		
1		
2		
3		

`ra_BoxPierce_Test(range_Yt, int_Lag, bool_ACF)`

Returns the Box-Pierce test statistics and p-Values for a time series in the range Yt .

$$Box - Pierce(q) = n \sum_{j=1}^m \rho_j^2 \sim X^2(m)$$

- **range_Yt**, A column or range of a time series.
- **int_Lag**, Positive integer (≥ 0).
- **bool_ACF**, If TRUE is for ACF, if FALSE is for PACF.

BOX-PIERCE TEST, ACF, Yt		
Lag	q-Stat	p-Value
0		
1		
2		
3		

`ra_DickeyFuller_ADF_Test(range_Yt, bool_Ascend_Yt, int_Lag, int_Type, alpha)`

Returns the statistics τ -Stat, τ -Critical, the p-Value, and whether it is stationary + [AutoRegression Coefficient, AIC, and BIC] for DFA (Augmented Dickey -Fuller) test.

$$\Delta Y_t = \mu + \lambda Y_{t-1} + \sum_{i=1}^p \delta_i \Delta Y_{t-i} + \beta T$$

- **range_Yt**, A column or range of a time series.
- **bool_Ascend_Yt**, is the order of the time series. TRUE means ascending order (\uparrow) with the most recent date on top. FALSE otherwise Descending (\downarrow).
- **int_Lag**, positive integer value. 0 if Dickey -Fuller; if ≥ 1 if Augmented Dickey -Fuller.
- **int_Type**, 0 if there is no constant or trend (nc); 1 if it is with constant and without trend (c); 2 if it is with constant and trend (ct).
- **Alpha**, significance level, alpha = [1%, 5%, 10%].



ADF TEST, Yt							
Lag	τ -Stat	τ -Critical	p-Value	Stationary?	Coeff.	AIC	BIC
1							
Autoregression Coefficients, $\Delta(Yt)$							
	Coeff	Std. Error	t-Stat	p-Value			
Constant							
Yt(-1)							
$\Delta(Yt(-1))$							
Trend							

ra_DickeyFuller_ADF_Critical(int_Obs, int_Type)

Returns the τ -Critical value for augmented Dickey -Fuller, alpha = [1%, 5%, 10%]. * MacKinnon (1996)

- **int_Obs**, Number of observations after adjustments or size of a time series.
- **int_Type**, 0 if there is no constant or trend (nc); 1 if it is with constant and without trend (c); 2 if it is with constant and trend (ct).

ra_DickeyFuller_ADF_pValue(t_Stat, int_Obs, int_Type)

Returns the approximate Dickey -Fuller p- Value for a time series of the Observations' τ - Stat statistic.

- **t_Stat**, test statistic value or tau.
- **int_Obs**, Number of observations after adjustments or size of a time series.
- **int_Type**, 0 if there is no constant or trend (nc); 1 if it is with constant and without trend (c); 2 if it is with constant and trend (ct).

ra_DickeyFuller_ADF_Reg(range_Yt, bool_Ascend_Yt, int_Lag, int_Type)

Returns the AutoRegression Coefficient for the augmented Dickey -Fuller (DFA) test.

- **range_Yt**, A column or range of a time series.
- **bool_Ascend_Yt**, is the order of the time series. TRUE means ascending order (\uparrow) with the most recent date on top. FALSE otherwise Descending (\downarrow).
- **int_Lag**, positive integer value. 0 if Dickey -Fuller; ≥ 1 if Dickey -Fuller Augmented
- **int_Type**, 0 if there is no constant or trend (nc); 1 if it is with constant and without trend (c); 2 if it is with constant and trend (ct).

ra_KPSS_Test(range_Yt, bool_Ascend_Yt, int_Lag, int_Type, alpha)

Returns the test statistic test- Stat, the test -Critical, the p- Value, and whether it is stationary + [variance corrected by HAC, AIC, and BIC] for the KPSS (Kwiatkowski -Phillips-Schmidt- Shin) test .

$$LM = \sum_{t=0}^p (Y_t - (\mu + \beta T)) / (T^2 f_0); f_0 = 1 - |\varepsilon_t| \text{ si } \varepsilon_t \leq 1$$

- **range_Yt**, A column or range of a time series.



- **bool_Ascend_Yt**, is the order of the time series. TRUE means ascending order (↑) with the most recent date on top. FALSE otherwise Descending (↓).
- **int_Lag**, Positive integer value (≥ 0).
- **int_Type**, 1 if it is with constant and without trend (c); 2 if it is with constant and trend (ct).
- **Alpha**, significance level, $\alpha = [1\%, 5\%, 10\%]$.

KPSS TEST, Yt							
Lag	test-Stat	test-Critical	p-Value	Stationary?	HAC	AIC	BIC
1							
Regression Coefficients, Yt							
	Coeff	Std. Error	t-Stat	p-Value			
Constant							
Trend							

ra_KPSS_Critical(int_Type)

Kwiatkowski -Phillips-Schmidt- Shin (KPSS) Critical test value, $\alpha = [1\%, 5\%, 10\%]$. *KPSS (1992, Table 1)

- **int_Type**, 1 if constant and no trend (c); 2 if constant and trend (ct).

ra_KPSS_pValue(t_Stat, int_Obs, t_Type)

Returns the approximate Dickey -Fuller p- Value for a time series of the test- Stat statistic of the Observations.

- **t_Stat**, test statistic test- Stat .
- **int_Obs**, Number of observations after adjustments, size of a time series.
- **t_Type**, 1 if it is with constant and without trend (c); 2 if it is with constant and trend (ct).

ra_KPSS_Reg(range_Yt, bool_Ascend_Yt, int_Lag, int_Type)

Returns the Regression Coefficients for the Kwiatkowski -Phillips-Schmidt- Shin (KPSS) test.

- **range_Yt**, A column or range of a time series.
- **bool_Ascend_Yt**, is the order of the time series. TRUE means ascending order (↑) with the most recent date on top. FALSE otherwise Descending (↓).
- **int_Lag**, Positive integer value (≥ 0).
- **int_Type**, 1 if it is with constant and without trend (c); 2 if it is constant and trend (ct).

ra_GARCH_Coeff(range_Yt, bool_Ascend_Yt, int_Alpha_p, int_Beta_q, bool_MeanCond, int_ErrDist, int_OptMethod)

Returns the coefficients, standard error, t- Stat, and p- Value for the Generalized AutoRegressive Conditional Heteroskedasticity GARCH(p,q) model .



$$Y_t = z\sigma_t$$

$$z \sim iidN(0,1)$$

$$\sigma_t^2 = \alpha_0 + \sum_{i=1}^p \alpha_i Y_{t-i}^2 + \sum_{j=1}^q \beta_j \sigma_{t-j}^2$$

- **range_Yt**, A column or range of a time series.
- **bool_Ascend_Yt**, is the order of the time series. TRUE means ascending order (↑) with the most recent date on top. FALSE otherwise Descending (↓).
- **int_Alpha_p**, Number of ARCH Alpha(p) parameters (non-negative integer, >=0).
- **int_Beta_q**, Number of Beta(q) GARCH parameters (non-negative integer, >=0).
- **bool_MeanCond**, conditional mean. TRUE include in model. FALSE do not include.
- **int_ErrDist**, default normal (Gaussian) ⁷.
- **int_OptMethod**, default Newton-Raphson (NR).

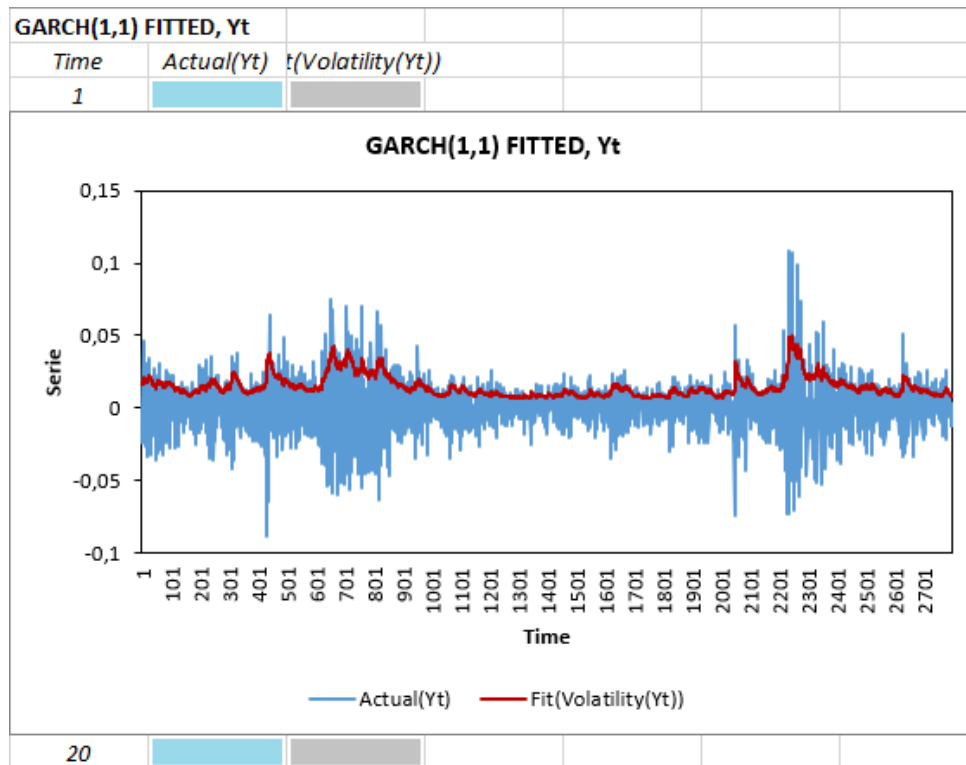
GARCH(1,1) MODEL, Yt				
	Coeff.	Std. Error	t-Stat	p-Value
Mean. μ				
ARCH. $\alpha 0$				
ARCH. $\alpha 1$				
GARCH. $\beta 1$				
# Obsevation		Log Likelihood	0	0

[ra_GARCH_Fitted\(range_Yt, bool_Ascend_Yt, range_Beta\)](#)

AutoRegressive Conditional Heteroskedasticity model GARCH(p,q).

- **range_Yt**, A column or range of a time series.
- **bool_Ascend_Yt**, is the order of the time series. TRUE means ascending order (↑) with the most recent date on top. FALSE otherwise Descending (↓).
- **range_Alpha**, A column or range of ARCH (Alpha) coefficients.
- **range_Beta**, A column or range of GARCH (Beta) coefficients.

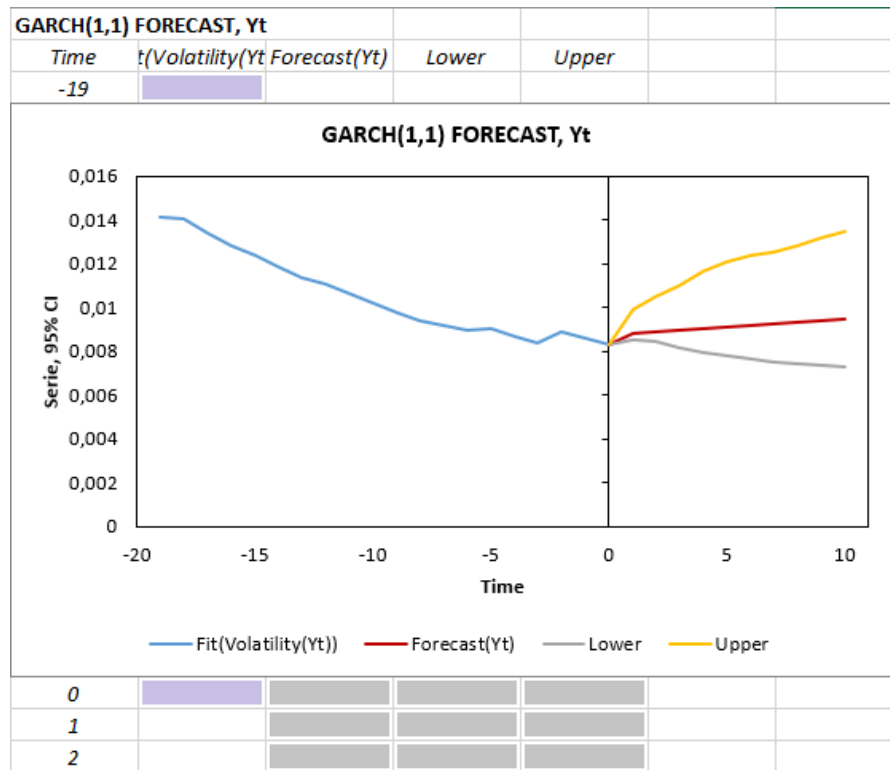
⁷Student error or probability distribution and Generalized Error Distribution (GED) is pending .



`ra_GARCH_Forecast(range_Yt, bool_Ascend_Yt, range_Alpha, range_Beta, int_nForecast, int_Interval, int_IterSamples)`

Returns a dynamic forecast column or matrix with confidence interval from the GARCH(p,q) model to a time series.

- **range_Yt**, A column or range of a time series.
- **bool_Ascend_Yt**, is the order of the time series. TRUE means ascending order (↑) with the most recent date on top. FALSE otherwise Descending (↓).
- **range_Alpha**, A column or range of ARCH (Alpha) coefficients.
- **range_Beta**, A column or range of GARCH (Beta) coefficients.
- **int_nForecast**, N-forecast number.
- **int_Interval**, confidence interval. 0 dynamic no interval, 1 Monte Carlo simulation for 68% interval, 2 for 95% interval, and 3 for 99.7% interval.
- **int_IterSamples**, Iteration number to estimate the confidence interval by the Monte Carlo method.



`ra_ARIMA_Coeff(range_Yt, bool_Ascend_Yt, int_AR_p, int_Diff_d, int_MA_q, int_OptMethod)`

Returns the coefficients, standard error, t - statistic, and p-Value of the AutoRegressive, Integrated, and Moving Average ARIMA(p,d,q) model .

- **range_Yt**, A column or range of a time series.
- **bool_Ascend_Yt**, is the order of the time series. TRUE means ascending order (↑) with the most recent date on top. FALSE otherwise Descending (↓).
- **int_AR_p**, Number of AR(p) parameters (non-negative integer, >=0).
- **int_Diff_d**, Order of integration(I) or number of Differentiations(d) (non-negative integer, >=0).
- **int_MA_q**, Number of MA(q) parameters (non-negative integer, >=0).
- **int_OptMethod**, AR(OLS) and MA(NR, Newton-Raphson)⁸.

$$Y_t = \phi_0 + \sum_{i=1}^p \phi_i Y_{t-1} + \sum_{j=1}^q \theta_j \varepsilon_{t-j}$$

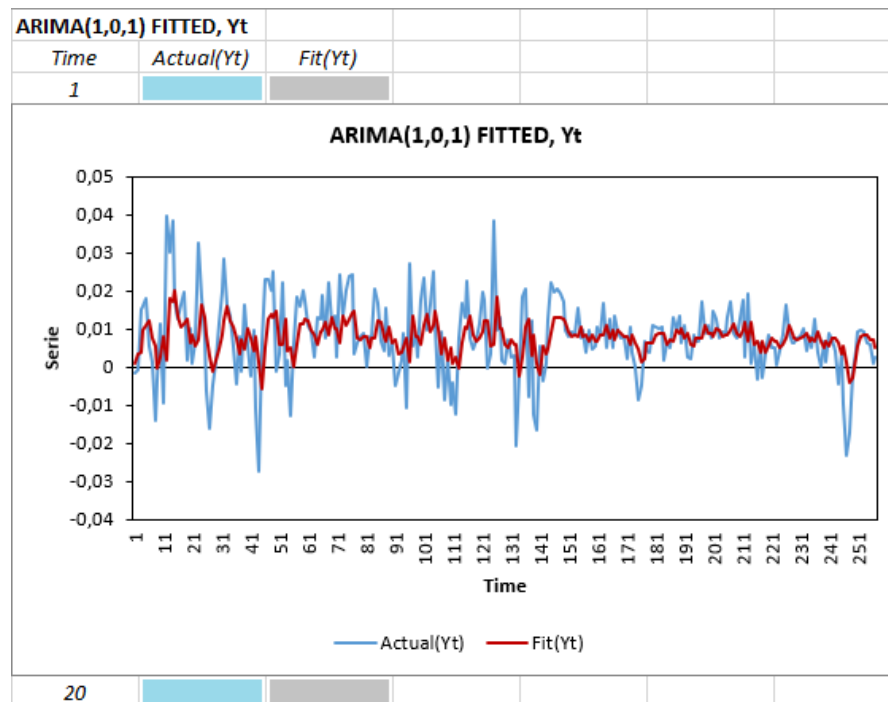
⁸For the AR model, it is estimated by Ordinary Least Squares (OLS) and for MA it is by Maximum Likelihood with Newton-Raphson (NR). For the ARIMA, GARCH models or the functions that require optimization, the implementation of optimization algorithms such as Levenberg-Marquardt, BHHH, BFGS or L-BFGS is planned.

ARIMA(1,0,1) MODEL, Yt				
	Coeff.	Std. Error	t-Stat	p-Value
AR. ϕ_0				
AR. ϕ_1				
MA. θ_1				
	# Observation	Log Likelihood	0	0

[ra_ARMA_Fitted\(range_Yt, bool_Ascend_Yt, constant, range_AR, range_MA\)](#)

Returns a fitted column of the AutoRegressive and Moving Average ARIMA(p,q) model.

- **range_Yt**, A column or range of a time series.
- **bool_Ascend_Yt**, is the order of the time series. TRUE means ascending order (\uparrow) with the most recent date on top. FALSE otherwise Descending (\downarrow).
- **constant**, ARMA constant, AR, MA or average of MA.
- **range_AR**, Range of AutoRegressive (AR) Coefficients.
- **range_MA**, range of Moving Average (MA) coefficients.



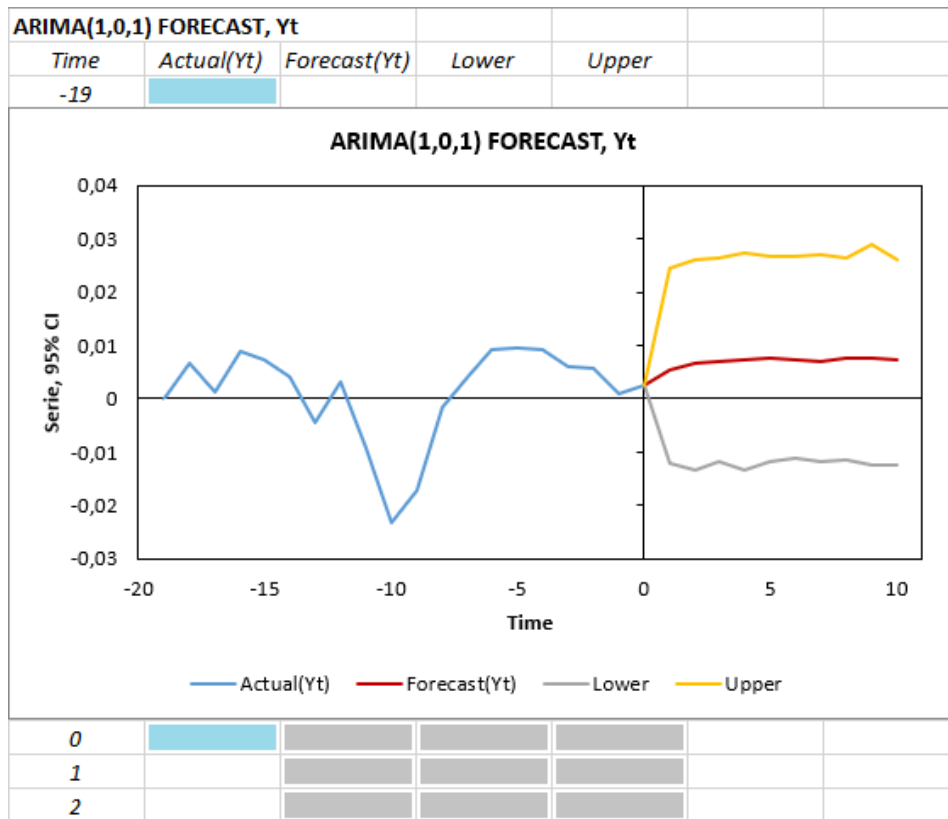
[ra_ARMA_Forecast\(range_Yt, bool_Ascend_Yt, constant, range_AR, range_MA, int_nForecast, int_Interval, int_IterSamples\)](#)

Returns a dynamic forecast column or matrix with confidence interval from the ARMA(p,q) model of a time series.

- **range_Yt**, A column or range of a time series.
- **bool_Ascend_Yt**, is the order of the time series. TRUE means ascending order (\uparrow) with the most recent date on top. FALSE otherwise Descending (\downarrow).
- **constant**, Constant ARMA, AR, MA or MA Average.
- **range_AR**, Range AutoRegression (AR) coefficients.



- **range_MA**, Moving average (MA) range coefficients.
- **int_nForecast**, number of N-forecast steps.
- **int_Interval**, confidence interval. 0 dynamic no interval, 1 Monte Carlo simulation for 68% interval, 2 for 95% interval, and 3 for 99.7% interval.
- **int_IterSamples**, Iteration number to estimate the confidence interval by the Monte Carlo method.



ra_InterpolateNum(x, x1, x2, y1, y2, h)

Returns the interpolation for y between x, x1, and x2 given y1 and y2.

$$\begin{Bmatrix} y_1 \\ y_? \\ y_2 \end{Bmatrix} = \begin{Bmatrix} x_1 \\ x \\ x_2 \end{Bmatrix}$$

- **x**, number between x1 and x2.
- **x1**, numerical value.
- **x2**, numerical value.
- **y1**, numerical value.
- **y2**, numerical value.
- **int_Type**, 0 for linear interpolation (default); 1 for logarithmic interpolation; 2 for harmonic interpolation.

ra_Range_Flip(range_Xij, bool_Flip)

Returns a flipped range of cells vertically if the condition is true.



- **range_Xij**, range containing numeric values without spaces. Could be a multi-column Xij range.
- **bool_Flip**, if equal to TRUE, flips the range of cells in the vertical direction.

[ra_Show_Lag\(range_Yt, bool_Ascend_Yt, int_Lag\)](#)

Displays a lagging column of a time series.

- **range_Yt**, A column or range of a time series.
- **bool_Ascend_Yt**, is the order of the time series. TRUE means ascending order (↑) with the most recent date on top. FALSE otherwise Descending (↓).
- **int_Lag**, Positive integer value (≥ 0).

[ra_Difference\(range_Yt, bool_Ascend_Yt, int_Diff_d\)](#)

Returns a column difference operation on a time series.

- **range_Yt**, A column or range of a time series.
- **bool_Ascend_Yt**, is the order of the time series. TRUE means ascending order (↑) with the most recent date on top. FALSE otherwise Descending (↓).
- **int_Diff_d**, Order of integration(I) or number of differentiations(d) (non-negative integer, ≥ 0)

[ra_raXL_Stat_License\(\)](#)

Displays details of the current or used license.

[ra_raXL_Stat_Version\(\)](#)

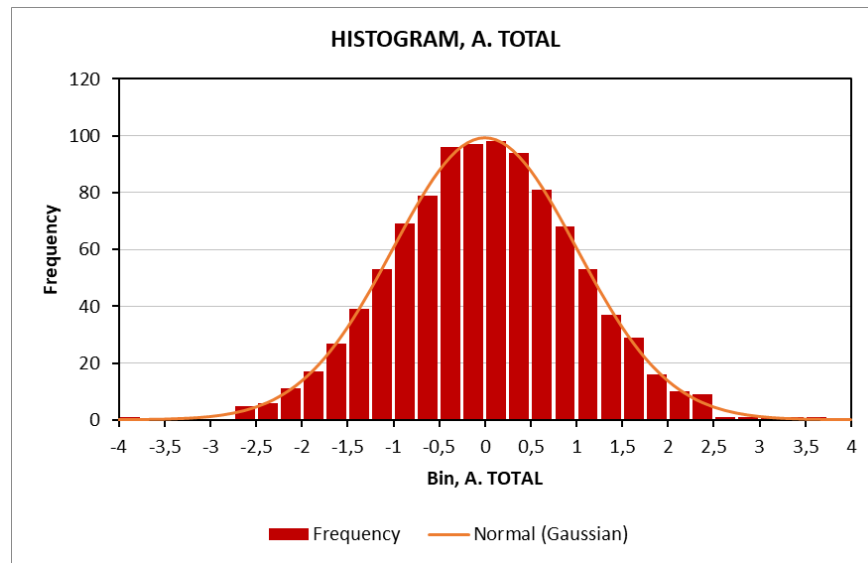
Shows supported and tested Excel versions of raXL Stat.

[ra_raXL_xIDCPU\(\)](#)

Reserved for raXL_Stat.lic

[ra_Histogram_Auto\(range_X, int_CurveSelect\)](#)

Return a table of frequencies with Bins automatic, cumulative or Normal curve useful for plotting a histogram. [Obs. > 4]



- **range_X**, A single or a multi-column cell range containing data.
- **int_CurveSelect**, Type of the curve overlay. 0 if there is no curve overlay. 1 if 'cumulative probability'. 2 if 'cumulative unit' and 3 if 'Normal (Gaussian)' is shown.

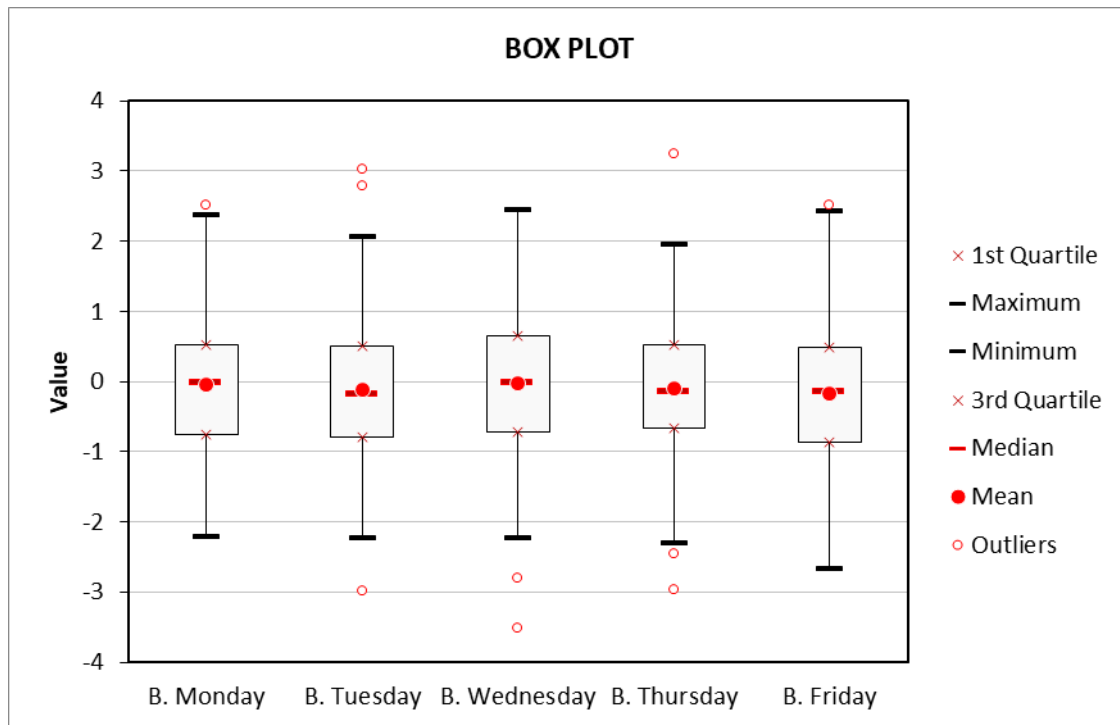
[ra_Histogram_Bin\(range_X, int_CurveSelect, val_XStart, val_XStep, val_XStop,\)](#)

Return a table of frequencies with bins setup, cumulative or Normal curve useful for plotting a histogram.

- **range_X**, A single or a multi-column cell range containing data.
- **int_CurveSelect**, Type of the curve overlay. 0 if there is no curve overlay. 1 if 'cumulative probability'. 2 if 'cumulative unit' and 3 if 'Normal (Gaussian)' is shown..
- **val_XStart**, New Start (minimum) value bins horizontal axis.
- **val_XStep**, Major unit of Step value between then Start and Stop bins.
- **val_XStop**, New Stop (maximum) value bins horizontal axis.

[ra_BoxPlot_Table\(range_X, val_Outliers, val_IQR\)](#)

Return a table of Quartile value [1st Quartile, Maximum, Minimum, 3rd Quartile, Median, Mean and Outliers] useful for plotting a Box plot and outliers.



- **range_X**, A single or a multi-column cell range containing data.
- **val_Outliers**, if TRUE include Outliers. if FALSE not include Outliers.
- **val_IQR**, Multipliers IQR (InterQuartile Range) value, for example 1.5.

[ra_JarqueBera_Test\(range_X, bool_Pop, val_Alpha\)](#)

Return JB-Stat, p-Value (probability) and Normality? for Jarque-Bera test of normality.

$$Jarque - Bera = n \left(\frac{S^2}{6} + \frac{(K - 3)^2}{24} \right) \sim \chi^2(2)$$

- **range_X**, "A column (range) of data or time series.
- **bool_Pop**, if TRUE use 'Population' skewness and kurtosis values. if FALSE use 'Sample' skewness and kurtosis values.
- **val_Alpha**, Significance level, alpha = [1%, 5%, 10%].

[ra_JarqueBera_Stat\(range_X, bool_Pop\)](#)

Return Jarque-Bera statistic (JB-Stat), for Jarque-Bera test of normality.

- **range_X**, A column (range) of data or time series.
- **bool_Pop**, if TRUE use 'Population' skewness and kurtosis values. if FALSE use 'Sample' skewness and kurtosis values.



ra_JarqueBera_pValue(val_JB_Stat)

Return p-Value (probability) for Jarque-Bera test of normality, Chi2(JB-Stat,2).

- **val_JB_Stat**, Jarque-Bera Statistic value.

ra_Skew_S(range_X)

Return the Skewness value of the distribution based on the Sample.

- **range_X**, A column (range) of data or time series.

ra_Kurt_S(range_X)

Return the Kurtosis value of the distribution based on the Sample.

- **range_X**, A column (range) of data or time series.

ra_Skew_P(range_X)

Return the Skewness value of the distribution based on the Population.

- **range_X**, A column (range) of data or time series.

ra_Kurt_P(range_X, bool_Subtract3)

Return the Kurtosis value of the distribution based on the Population.

- **range_X**, A column (range) of data or time series.
- **bool_Subtract3**, if TRUE is subtracted to make the kurtosis of a normal distribution zero. if FALSE is no subtracted.

ra_AndersonDarling_Test(range_X, int_Dist, val_Alpha)

Return the AD-Stat, p-Value (probability) and distribution hypothesis? for the one-sample Anderson-Darling test.

$$AD^2 = -N - S/N$$

$$S = \sum_{i=1}^N (2i - 1)(\log(X_i) + \log(1 - X_{n-i+1}))$$

- **range_X**, A column (range) of data or time series.
- **int_Dist**, Distribution type. if 0 'Generic' distribution, if 1 'Normal', if 2 'unmodified Normal', if 3 'LogNormal'.
- **val_Alpha**, Significance level, alpha = [1%, 5%, 10%].



ra_AndersonDarling_Stat(range_X, int_Dist)

Return the Anderson-Darling test statistic (AD-Stat) for theoretical test in range data.

- **range_X**, A column (range) of data or time series.
- **int_Dist**, Distribution type. if 0 'Generic' distribution, if 1 'Normal', if 2 'unmodified Normal', if 3 'LogNormal'.

ra_AndersonDarling_pValue(val_AD_Stat, int_Dist)

"Return estimated p-Value (probability) for the one-sample Anderson-Darling test..

- **val_AD_Stat**, Anderson-Darling statistic value..
- **int_Dist**, Distribution type. if 0 'Generic' distribution, if 1 'Normal', if 2 'unmodified Normal', if 3 'LogNormal'.

ra_ShapiroWilk_Test(range_X, int_Dist, val_Alpha)

Return the statistic SW-Stat, p-Value (probability) and Normality? for Shapiro-Wilk test of normality. Use Royston algorithm, Obs[2;5000]

$$SW = \frac{\sum_{i=1}^n (a_i x_i)^2}{\sum_{i=1}^n (x_i - \mu)^2}$$

- **range_X**, A column (range) of data or time series.
- **val_Alpha**, Significance level, alpha = [1%, 5%, 10%].

ra_ShapiroWilk_Stat(range_X, int_Dist, val_Alpha)

Return Shapiro-Wilk statistic (SW-Stat) of Shapiro-Wilk test of normality. Use Royston algorithm, Obs[2;5000])

- **range_X**, A column (range) of data or time series.

ra_ShapiroWilk_pValue(val_SW_Stat, int_Obs)

Return p-Value (probability) for Shapiro-Wilk test of normality.

- **val_SW_Stat**, Shapiro-Wilk Statistic value..
- **int_Obs**, Number of observations in the range data or time series..

ra_Descriptive_Stats(range_X)

Return table descriptive statistics sample a range data or time series.

- **range_X**, A single or a multi-column cell range containing data.



[ra_CoVar_Matrix\(range_X, bool_Pop\)](#)

Return the CoVariance (Cov) matrix Population or Sample of multiple a range data or time series.

- **range_X**, A single or a multi-column cell range containing data.
- **bool_Pop**, if TRUE use 'Population' covariance values. if FALSE use 'Sample' covariance values.

[ra_Correl_Coeff_Matrix\(range_X, int_LowTriang, val_Alpha\)](#)

Return the Pearson Correlation coefficients matrix (R, R², p-Value and No correlation (R=0)?) of multiple a range data or time series.

- **range_X**, A single or a multi-column cell range containing data.
- **int_LowTriang**, Lower triangular matrix. if is 0 correlation coefficients R. if 1 coefficient R-squared. if is 2 p-Values for R based on t-Stat. if 3 No correlation (R=0)?
- **val_Alpha**, Significance level, alpha = [1%, 5%, 10%].

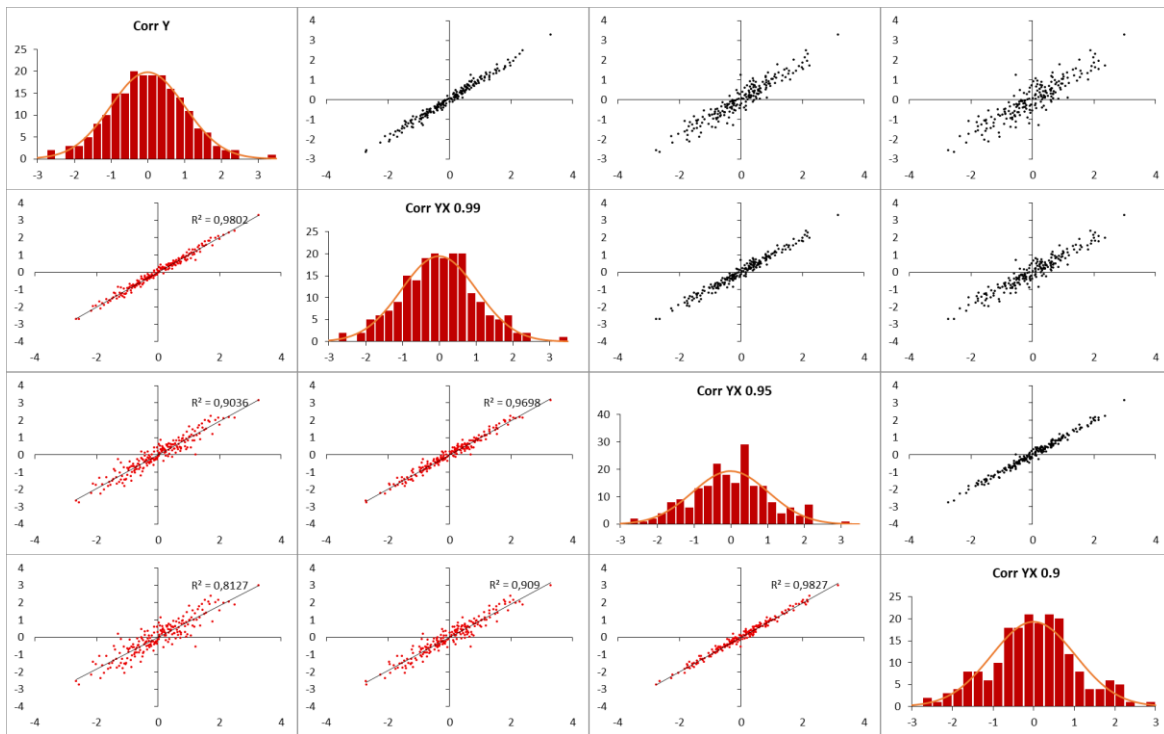
[ra_MissingDataINFO\(range_X\)](#)

Return count the missing data (blanks) and incorrect type values information [Range total, numeric/date, Empty/Missing, String, Boolean, ExcelError, Unheard and Non-numeric].

- **range_X**, Cell range of one or more columns containing data in which missing (blanks) or incorrect type values might be present.

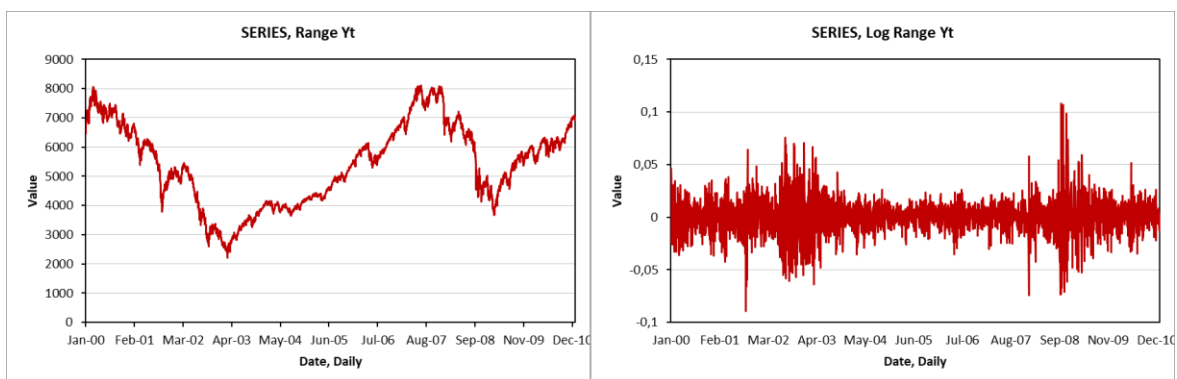
[Scatter plot matrix](#)

Displays plots multiples series a Line/Symbol for date, of column, of XY line, of Bar, of Area and variantes. The matrix scatter graph or diagram has no function except to create the histogram.



Plots multiple series

Display XY Scatter matrix plot and histogram included a cumulative or normal curve. For multi-series chart, it does not have a function except.



5. Troubleshooting

Sometimes, a problem may arise with the activation or operation of the plugin. For example, the plugin may not be configured correctly or an update may fail.



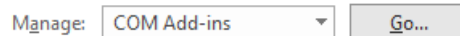
If you have a problem that is not described below or would like to discuss any aspect of the product, you can contact us at rubenfapaza@gmail.com.

However, the first step to troubleshooting is to make sure you have the latest version of the plugin installed. We regularly release fixes and new features at <https://ruben-apaza.blogspot.com/p/raxl-stat.html>, so it's important to keep your plugin or software up to date. Below are some common issues you may encounter:

5.1. The plugin menu tab or ribbon is not visible

After configuring the plugin, the "raXL Stat" tab should be visible within Excel (Figure 6). If it is not visible, the add-in may not have been activated correctly. To fix this:

- You can try to follow the steps described in [2.4. Download and use the plugin](#).
- If the above step does not work, click on the **File tab** in Excel:
- Then click on **Options** (located in the lower left corner):
- On the Options screen, select the **Add -ins** section .



- **View and Manage** option near the bottom, select "Excel COM Add-ins" and press "Go...":

You should see raXL Stat Add -in with check, make sure it is selected.

5.2. The add-in menu tab or ribbon is not visible (error message in Excel's bottom status bar)

When starting Excel after configuring the add-in, the tab is not visible. When checking the status bar at the bottom of Excel, the following error message appears:



(ExcelDNA add-in initializing integration failed: Could not load file or assembly ' System.Xml, Version =4.0.0.0, Culture=neutral, PublickKeyToken =.... ')

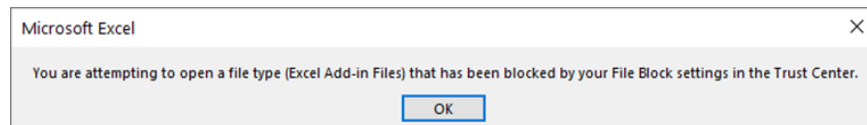
This error indicates that some of the components required for certain Microsoft applications to work on your PC are missing, such as raXL Stat.

In this case, you need to download and install the Microsoft .NET Framework components from the Microsoft website by selecting the "Download .NET Framework 4.5.2" or later option described in [2.2. System Requirements](#)

Once you have installed it we suggest you restart your PC and try to start raXL Stat.

5.3. Problems starting Excel: You are trying to open a file type (Excel add-in file) that has been blocked by the File Block settings in the Trust Center.

When you start Excel after installing the add-in, you may see the following message:



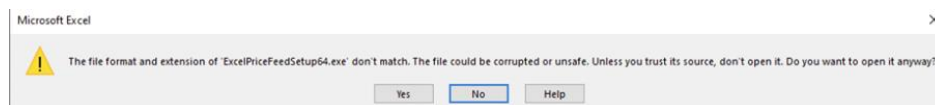
To resolve this, open the Excel Options screen by clicking the **File** tab, then **Options** (as shown at the top of this page) and navigate to "Trust Center."

Press the "Trust Center Settings..." button, then select "File Blocking Settings" on the left side.

Make sure the "Excel Add-in Files" checkbox is NOT checked.

5.4. Problems starting Excel: The file format and extension of the "add-in" do not match.

When you start Excel, after configuring the add-in, you may see the following message:



This usually indicates that you have installed the wrong version of the add-in. For example, you may have inadvertently installed the 64-bit version of the add-in, while you are using the 32-bit version of Excel.

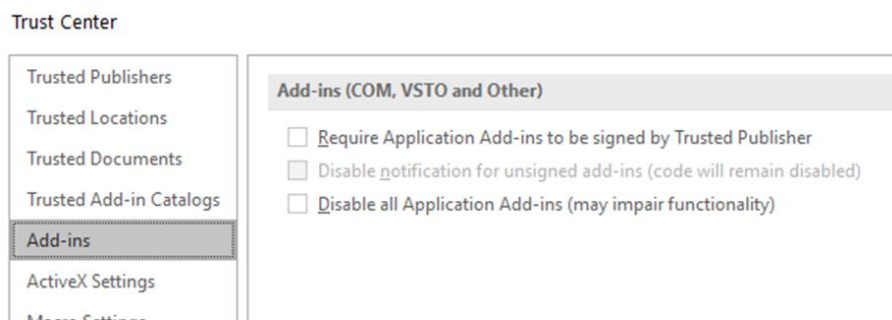
In this case, the first step is to open the correct add-in, described in [2.3. Excel version](#)

5.5. The plugin formulas do not work and there are problems when starting

If Excel formulas aren't working and just return "#N/A" or you can't open, the most likely cause is that Excel doesn't trust the add-in.

To resolve this, open the Excel Options screen by clicking the **File** tab, then **Options** (as shown at the top of this page) and navigate to "Trust Center."

Press the "Trust Center Settings..." button, then select "Add-ons" on the left side:



Make sure none of the three options are selected. If you select any of them, you may not be able to use the plugin.

You will need to restart Excel after making changes to any of these options.



5.6. When starting, an error is received: "Could not load file or assembly ' System.Net.Http, Version =4.2.0.0"

This error indicates that some of the components required for certain Microsoft applications to run on your PC are missing.

In this case, you must download and install the Microsoft .NET Framework components described in [2.2. System Requirements](#)

Once you have installed it we suggest you restart your PC and try to start raXL Stat.

5.7. When running the functions, I only see zeros "0"

In this case, it may be that there is an incorrect cell reference in the formula or calculation, so we suggest selecting the correct cells according to specification. It may also be that the license has expired, in this case it is recommended not to save changes in the open sheet, however, calculations can be recovered with raXL Stat with a new license.

5.8. The raXL Stat ribbon menu in Excel does not run or respond

To fix and reactivate the ribbon menu in Excel, click on the same Help-Info menu and from there reset ribbon.

Finally, if you have any questions regarding the use of the raXL Stat plugin, you are unable to fix a persistent problem or find no answers even after reading this manual, please feel free to contact us by sending an email to: rubenfapaza@gmail.com. The personal blog <https://ruben-apaza.blogspot.com/p/raxl-stat.html> will show updates, fixes to existing versions and releases of new versions.

Thank you!



Annexes

A. VBA Macro with Button

```
Option Explicit
Option Base 1
Sub Macro_GARCHCoeff()
Application.Calculation = xlCalculationManual
Dim runResult As Variant
Dim result() As Double
Dim rngRange As Range
Dim boolAscend As Boolean
Dim intP As Integer
Dim intQ As Integer
Dim intMuCond As Boolean
Dim i As Integer
Set rngRange = ActiveSheet.Range("B2:B1001")
boolAscend = False
intP = 1
intQ = 1
intMuCond = False
ReDim result(intP + intQ + 1, 1)
runResult = Application.Run("ra_GARCH_Coeff", rngRange, boolAscend, intP, intQ, intMuCond)
For i = 1 To intP + intQ + 1
result(i, 1) = runResult(i, 1)
Next i
Range("J3:J5").Select
Selection.FormulaArray = result
Application.Calculation = xlCalculationAutomatic
End Sub
```