PrimaXL V2017
Quick Start Guide

FIAN RESEARCH

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Introductory Remarks

This is the Quick Start Guide of PrimaXL add-in. Add-in is a software that adds new features to Microsoft Excel.

PrimaXL was developed with the purpose of extending the capabilities of the standard Excel in the data mining and time series[1] analysis.

PrimaXL was developed for use by beginners as well as experts. The easiest way to execute the functions is through the intuitive ribbon menu. If necessary, the user may directly type the functions in the spreadsheet cells or may invoke the functions from a VBA script.

This Quick Start Guide is intended to help you through the basic setup process while providing an overview of the PrimaXL's ribbon menu and functions. Please, refer to the User's Reference Manual for more in-depth information on the functions.

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[1] A representative example of the time series is that of the financial asset prices and returns.

1. Installing PrimaXL

1.1 System Requirements and Installation

PrimaXL is an add-in application that resides within Microsoft Excel. Thus, in order to install it, you need to have a version of Microsoft Excel installed on your PC. The requirements are as following:

1. PC running Windows 7 or later[2].

2. Microsoft Excel 2007 or later (32 bit or 64 bit).

3. Microsoft .NET Framework 4.0 or later version.

4. Connection to the internet in order to validate the license key.

Please, notice that in case your PC does not yet have the Microsoft .NET Framework installed, the setup program will install it before the PrimaXL software. Microsoft .NET Framework is maintained and supported by Microsoft. Its latest versions are freely available from *www.microsoft.com/en-us/download/*.

After verifying the compliance with the requirements, you can install PrimaXL add-in by executing *PrimaXL installer* located in the main folder. Please, remember to close all instances of Excel before starting the installation process. The Figure 1.1 shows the initial screen of the installer.
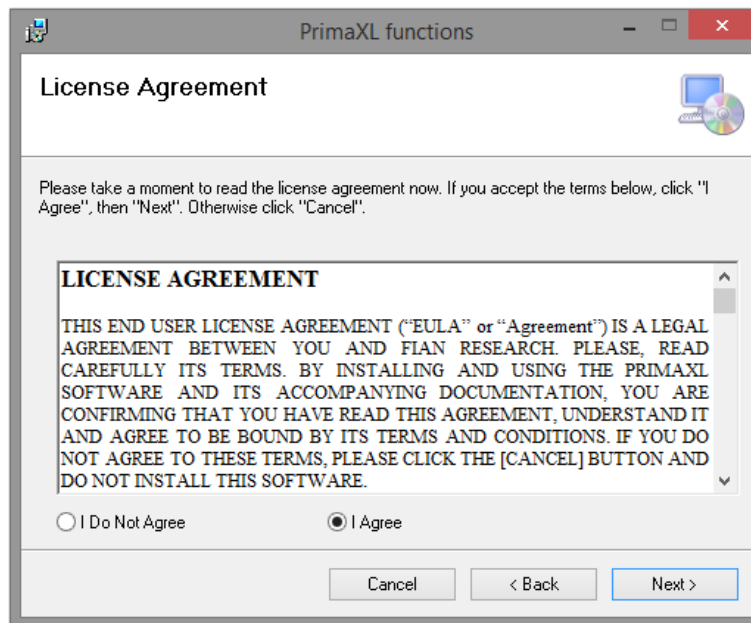

Figure 1.1

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[2] Our apologies to the Mac OS users.

PrimaXL is composed of 2 modules: the XLL module that contains the functions and the COM module that displays the ribbon menu. You are taken first to the installation of the XLL module. Please, leave the installation folder as suggested by the installer unless you have some other compelling reasons against it.

Then, you have to agree with the End User License Agreement (EULA) in order to continue (see Figure 1.2).

Figure 1.2

Next, you are taken to the installation of the COM module. You are guided through as before.

After the installation is over, start Excel and you can see that there is a new menu tab named **PrimaXL**. You can select it to access the program's ribbon menu.

1.2 Installing the License

As soon as you complete the basic installation process, PrimaXL is still in the *trial mode*. In the trial mode, only a reduced set of functions are available to the user. A disabled function[3] when typed directly into the spreadsheet, will always return a value 0. Also, you can see that several features of the menu remain disabled (see Figure 1.3).

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[3] Disabled functions correspond to the disabled features of the ribbon menu.
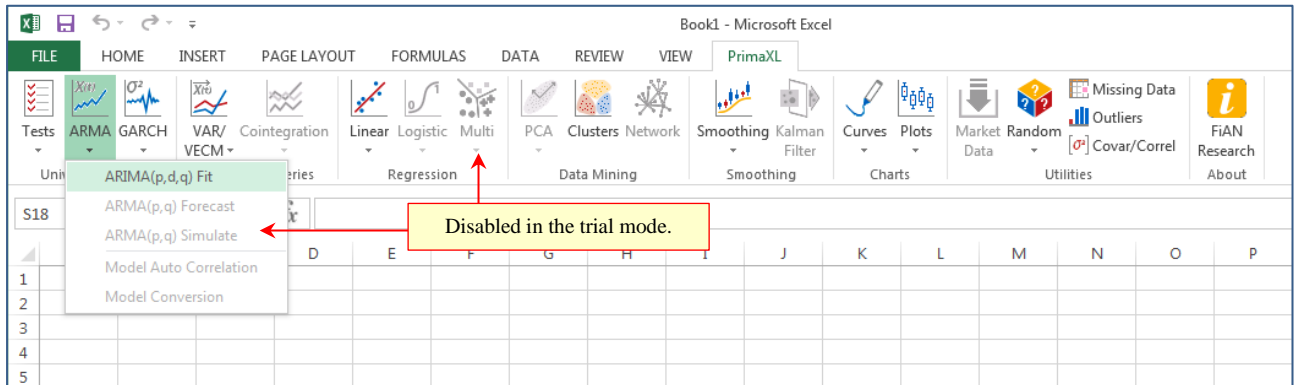
Figure 1.3

In order to gain a full access to the PrimaXL add-in, you need to install the license[4]. Please click on the menu button [i] and <u>enter the license key that comes with your purchase</u>[5]. During the key validation process, <u>your PC must be connected to the internet</u>.
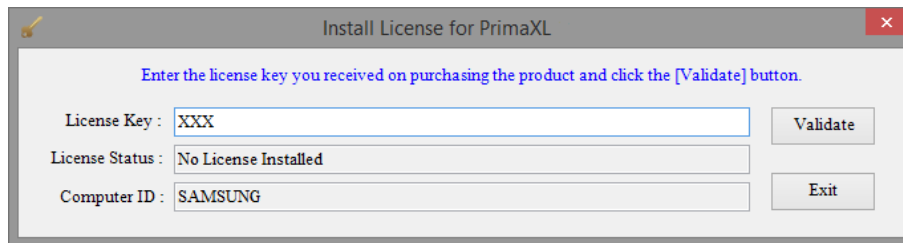

Figure 1.4

After installing the license, exit the form. Now you can see that all of the menu items are enabled.
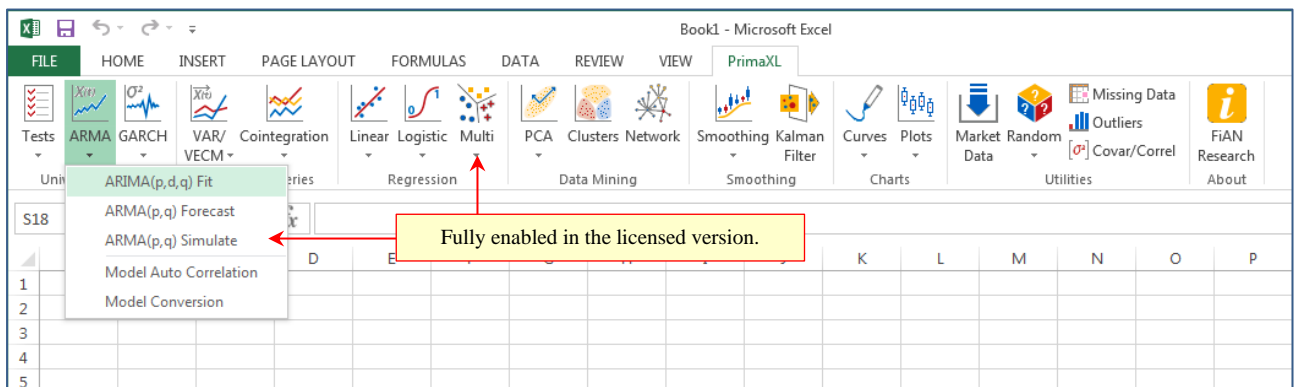

Figure 1.5

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[4] You can install the license by validating a license key.

[5] And click on the **Validate** button.

Now, when you click on the menu button , you will see the following Figure 1.6 instead of the Figure 1.4.

Figure 1.6

1.3 Uninstalling the Program

In order to safely remove the PrimaXL components, go to the *Windows Control Panel* and click on *Uninstall a program*. Then, double click on the *PrimaXL functions* and *PrimaXL ribbon menu*.

The uninstall process only removes the add-in software and leaves the previously installed license intact. Thus, in the future when a free upgrade becomes available you will be able to install it without having to validate the license key again. However, this also implies that your license is bound to a specific hardware and you will not be able to transfer it from one machine to another.

2. Using PrimaXL

2.1 Overview

The PrimaXL functions can be applied in three different ways.

1) **From PrimaXL ribbon menu**: This is the easiest way of accessing PrimaXL functions. Select the desired task and complete the blanks in the menu form. You don't have to worry about the syntax. "No typing… just select and click!"

2) **By typing the function manually into the spreadsheet cell(s)**: In this case, the user should strictly follow the correct syntax.

3) **Call from a VBA script**: Use the VBA method Application.Run.

In the following sections, we will briefly review the PrimaXL ribbon menu and see how easy it really is to use it.

2.2 PrimaXL Ribbon Menu

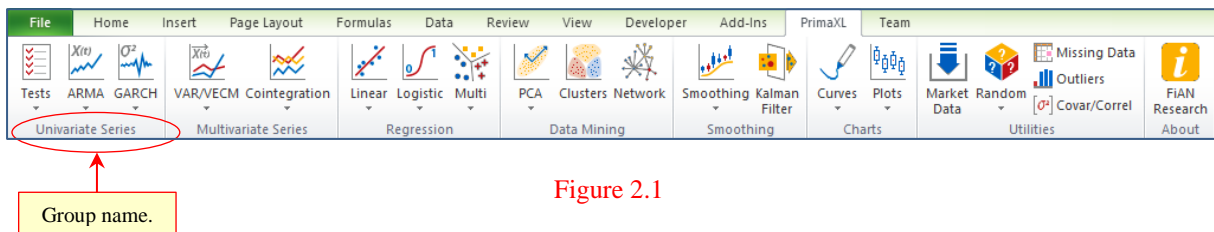PrimaXL - V2017 ribbon menu looks as the figure below.

Figure 2.1

One thing we can notice is that the buttons are organized in groups. The details are as following.

1. GROUP : Univariate Series

    1.1. Tests

    → AR Characteristic Roots

    → Auto Correlation

    → Identify AR(p) Model

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$\rightarrow$ Fit

$\rightarrow$ Forecast

$\rightarrow$ Test

3.2. Logistic

$\rightarrow$ Fit

$\rightarrow$ Forecast

$\rightarrow$ Test

3.3. Multi

$\rightarrow$ Fit

$\rightarrow$ Forecast

$\rightarrow$ Test

4. GROUP : Data Mining

4.1. PCA

$\rightarrow$ Principal Component Analysis

$\rightarrow$ Dimension Reduction

4.2. Clusters

4.3. Network

5. GROUP : Smoothing

5.1. Smoothing

$\rightarrow$ Exponential Smoothing Fit

$\rightarrow$ Exponential Smoothing Forecast

$\rightarrow$ Moving Averages

5.2. Kalman Filter

6. GROUP : Charts

6.1. 　 Curves

→　Fit Polynomial

→　Fit Bezier

→　Interpolate Linear

→　Interpolate Polynomial

→　Interpolate Cubic Spline

6.2. 　 Plots

→　Box Plot

→　Histogram

→　QQ Plot

7. GROUP : Utilities

7.1. 　 Market Data

7.2. 　 Random

→　Univariate Sampling

→　Correlated Sampling

7.3. 　 Missing Data

7.4. 　 Outliers

7.5. 　 Covariance/Correlation

8. GROUP : About

8.1. 　 FIAN Research

2.3 Example

Let us illustrate the use of PrimaXL with an example. We will apply the *k*-means clustering method which is one of the most widely used unsupervised learning methods. It is

simple and yet powerful. Quite often, it is part of what we call "exploratory analysis": the first step in making sense of the given data. In this method, each cluster is defined by a "centroid" and the observations are clustered around it.

As seen in the next Figure 2.2, from the PrimaXL ribbon menu we click on the **Clusters** button to bring up the menu form.
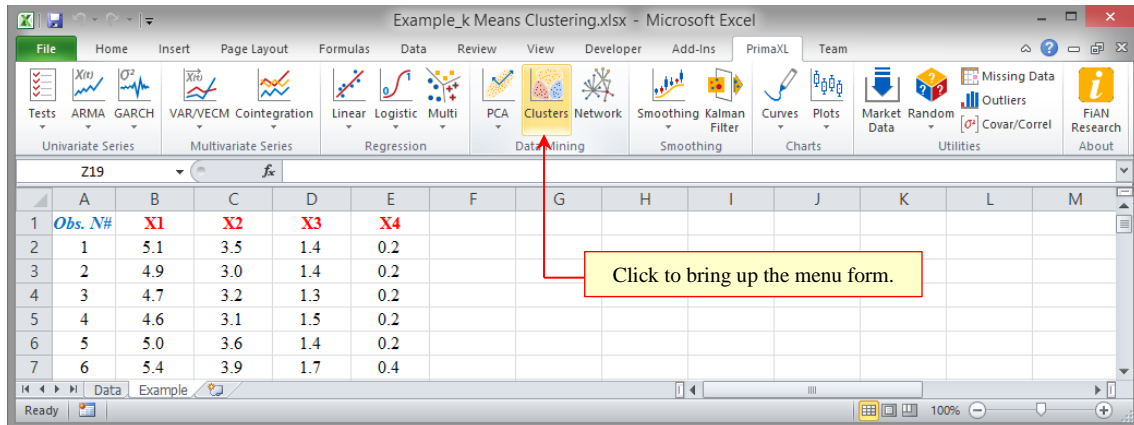

Figure 2.2

Then, a menu form as shown in the Figure 2.3 appears. Please, notice that the menu form is organized in two big groups: **Input and Specification** and **Output**.
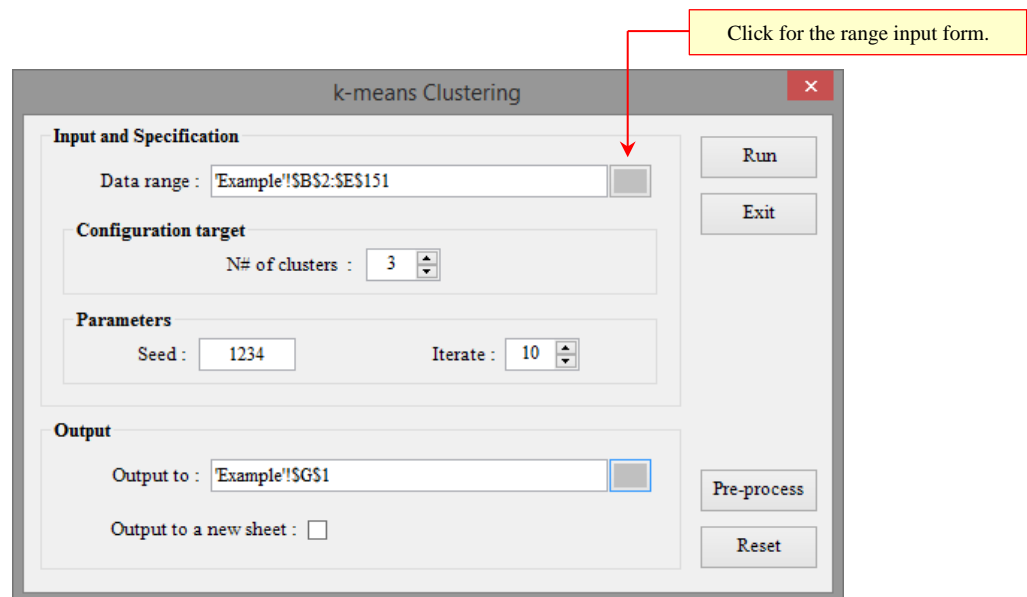

Figure 2.3

First, we have to complete the **Input and Specification** group. At the topmost field we need to enter the *Data range*. We can either type directly in the blank field or press the

small button on the right side to invoke the range input form. This last method is easier and preferable way of entering error free range values.

Then, we move down and specify the *N# of clusters* that are targeted. The random number generator seed (*Seed*) and the iteration number (*Iterate*) are necessary for the stochastic iterative algorithm. These numbers have to be positive integers.

Finally, we can proceed to the **Output** group. Here, we have to specify the location of the output (within an existing worksheet) or check the box *Output to a new sheet* in order to create a new worksheet and stream the output to it. When we are done filling out the menu form, we can press the **RUN** button to generate the result as in the Figure 2.4 and Figure 2.5.

CLUSTER ANALYSIS RESULT (target = 3 clusters)								
Obs. N#	*X1*	*X2*	*X3*	*X4*	*Dist. 0*	*Dist. 1*	*Dist. 2*	*Cluster ID*
1	5.1	3.5	1.4	0.2	0.141	5.060	3.419	0
2	4.9	3.0	1.4	0.2	0.448	5.115	3.399	0
3	4.7	3.2	1.3	0.2	0.417	5.279	3.569	0
4	4.6	3.1	1.5	0.2	0.525	5.154	3.422	0
5	5.0	3.6	1.4	0.2	0.189	5.104	3.467	0
6	5.4	3.9	1.7	0.4	0.677	4.681	3.147	0
7	4.6	3.4	1.4	0.3	0.415	5.211	3.517	0
8	5.0	3.4	1.5	0.2	0.066	5.003	3.337	0

Figure 2.4

In this example[6], we had targeted three clusters. The Figure 2.4 shows[7] a large table with the clustering details that was created as part of the result output. The last column of this table gives the *Cluster ID* of the observations[8].

Also, the table of the centroid coordinates and a summary are generated as part of the result output (Figure 2.5). We can see that the cluster sizes are 50, 38 and 62 each.

Cluster ID	X1	X2	X3	X4
0	5.006	3.428	1.462	0.246
1	6.850	3.074	5.742	2.071
2	5.902	2.748	4.394	1.434

Cluster ID	Population			
0	50			
1	38			
2	62			

Figure 2.5

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[6] This example along with the data can be found in the workbook "*Example_k Means Clustering.xlsx*".

[7] Only a few rows from the top portion are shown.

[8] A *Cluster ID* is an integer number equal or larger than 0.

3. Summary of Functions

The PrimaXL functions can be summarized in the following table. Please, notice that the functions are grouped by the shared purpose. The prefix "TS" is used in naming the time series functions.

FUNCTION NAME	PURPOSE
AvgExp *AvgRunning* *AvgWeighted* *AvgWeightedGeneral*	Calculate various types of moving averages.
ClusterCenters	Applies the Lloyd's algorithm and calculates the cluster centers. k-means clustering.
CorrelatedSamples	Generates correlated samples from uncorrelated ones.
CorrMatrix *CovMatrix*	Calculate the correlation matrix or the covariance matrix of multiple random variable.
DataCompleteRows *DataCompleteRows2* *DataCountCompleteRows* *DataCountCompleteRows2* *DataTransform* *DataTransformTest* *MissingDataFill* *MissingDataMask*	Manipulation of missing data. Data transformation.
DetrendPoly *FitBezier* *FitPoly* *FitPolyCoeff* *FitPolyPt*	Used to fit the trends present in *X* vs *Y* data sets.
InterpolateLinear *InterpolateLinearPt* *InterpolatePoly* *InterpolatePolyPt* *InterpolateSpline* *InterpolateSplinePt*	Used for the interpolation.
Kalman	Applies the Kalman algorithm to a univariate time series.
LogisticCoeff *LogisticCoefOneVsAll* *LogisticConfMatrix* *LogisticConfMatrixMulti* *LogisticForecast* *LogisticForecastMulti*	Logistic regression. "One vs all" multiclass classification.

AdjMatrix *NetworkCommunityStruct* *NetworkCommunityStructAdj* *NetworkModularity* *NetworkModularityAdj*	Network modularity analysis and community structure.
OLSANOVA *OLSCoeff* *OLSForecast* *OLSLeverage* *OLSResiduals* *OLSStat* *OLSTest*	Linear regression by Ordinary Least Square (OLS) method.
OutliersGet *OutliersTrim*	Deal with the outliers.
PCCommunality *PCInputReduced* *PCLoads* *PCLoadsReduced* *PCScores* *PCVariance*	Principal component analysis (PCA) and dimension reduction.
RandomBernoulli *RandomBinomial* *RandomCauchy* *RandomChiSqr* *RandomLognormal* *RandomNormal* *RandomPoisson* *RandomStudentT* *RandomUniform*	Generate random numbers for simulation.
RangeFlip	Flips a cell range if the condition is true.
TableHisto *TableQQGaussPlot* *TableQQPlot* *TableQQSTTPlot*	Generate tables for various types of data plots.
TSACF *TSACFAR* *TSACFARMA* *TSACFMA* *TSACFTest*	Calculate or test the Auto-Correlation Function (ACF).
TSARCharRoots	Calculates the characteristic roots using the AR parameters.

TSARCHFit *TSARCHForecst* *TSARCHSimul* *TSARCHVol*	Apply the Auto-Regressive Conditional Heteroskedasticity ARCH(p) model.
TSARIMAFit *TSARMAForecast* *TSARMASimul* *TSARSimul* *TSARStat*	Apply the Auto-Regressive Moving Average ARMA(p,q) model.
TSConvARMAtoMA *TSConvARtoMA* *TSConvMAtoAR*	Time series model conversions.
TSDickeyFuller *TSDickeyFullerAugmented*	Dickey-Fuller unit root test and its variant.
TSDifference	Applies difference operator to a time series.
TSEngleGranger *TSEngleGrangerSpread* *TSEngleGrangerSpreadForecast*	Apply Engle-Granger method for the cointegration test.
TSGARCHFit *TSGARCHForecast* *TSGARCHSimul* *TSGARCHVol*	Apply the Generalized Auto-Regressive Conditional Heteroskedasticity GARCH(p,q) model.
TSHoltFit *TSHoltForecast* *TSHoltSmooth*	Apply Holt's exponential smoothing method.
TSIsInvertibleMA *TSIsStationaryAR*	Calculate the characteristic roots and check for the stationarity or the invertibility.
TSLjungBox	Calculates the Ljung-Box test statistics and the p-values.
TSLogRate	Calculates the logarithmic rate of return.
TSShowLag	Shows the lagged steps of a time series.
TSVARFit *TSVARFit2* *TSVARForecast* *TSVARSimul*	Apply the Vector Auto-Regressive (VAR) model to a multivariate time series.
TSVECMFit *TSVECMForecast* *TSVECMSimul*	Apply the Vector Error Correction Model (VECM) to a multivariate time series.

Getting Help

PrimaXL comes with 3 manuals, each one with its intended purpose. These manuals should provide most of the help you will need.

1. Quick Start Guide (Free)

   It guides the user through the installation process. It provides a quick introduction and overview of the PrimaXL ribbon menu and functions.

2. User's Reference Manual (Free)

   It provides detailed explanations of the PrimaXL functions. The functions are listed in the alphabetical order for easy consultation.

3. User's Guide (Only with the purchase)

   It explains the use of PrimaXL with examples. It is intended to serve both as an instructional resource and as a practical help. As supplementary material, there are several Excel workbooks with sample data and examples.

   If your question is still unanswered even after reading the manuals, please feel free to contact us by sending an email to:

   contact@fianresearch.com

   Also, our web-site *www.fianresearch.com* will show any updates, fixes of the existing version and the release of new versions.

   Thank you !