Software Corner:

RKWard: Installation and use

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Many readers of *SRB* are likely familiar with the free, open-source statistical software package R. R offers a staggeringly wide range of analyses and outputs, besting every other general statistics package on the market, for free. This value, however, comes at a cost that may seem too steep for many users: it is command-line only. One must learn to write R code to take advantage of this software, and although the code itself is relatively memorable and intuitive, it cannot compete with the ease of use offered by the graphical user interfaces (GUIs) of competing packages, such as SPSS/PASW—a software package whose price can run over a thousand US dollars.

What is RKWard?

RKWard seeks to lower the usability barrier to entry into statistical analysis with R by providing a GUI frontend that hides much of the code from the use (although it is easy to inspect in the console for those who wish to do so). Furthermore, it streamlines the sometimes-maddening process of importing data into R, and can read SPSS and Stata files natively in addition to standard text formats. Finally, its general look-and-feel will be immediately familiar to those who have used SPSS, further easing entry for novices. It has been in development since 2005, and achieved its first stable release in 2011.

Although it uses the KDE desktop environment, which is usually found on Linux systems, it is not limited to computers running Linux/Unix. It also has a Windows version, and since the Macintosh OS is based on FreeBSD (another Unix variant), it can also be used on the Mac, perhaps making RKWard the only free, GUI-based, cross-platform statistical package available.

RKWard not only performs traditional statistical analyses (e.g., descriptive statistics, correlation, *t*-tests, regression), but, of particular interest to the *SRB* readership, with the LTM package installed, it can also perform a wide range of item response theory (IRT) analyses. For free.

However, as is the case with many FOSS (free, open-source software) packages, getting started can still be somewhat daunting. This goal of this article is to walk you through obtaining the software, installing the software on either a Windows or a Macintosh computer, importing a data file, and becoming familiar with the interface.

Obtaining and installing the software

As of late October, the stable version of RKWard is version 0.6.0. It is easily installed on Windows and MacOS X 10.7 "Lion" or above, and less-easily installed on MacOS X 10.6 or earlier. For step-by-step screencasts of each of these three installation scenarios, please see my YouTube channel, under the name "AaronBattyVideos".

Windows

1.   Obtain the software

The RKWard project page for Windows can be found at the (shortened) URL below (or linked from the installation video on YouTube):

http://goo.gl/FPTNM

Scroll down the page to the section titled "Standard Installation: Complete installation bundle" and click the link to the "binary installation bundle" to download the installer (134 MB).

2.   Install the software

Once the file has downloaded, simply double-click it to install. You will need to give it permission, etc. When it concludes, click "Close", and a new shortcut will be on your desktop. This can be moved to any location you wish, of course, but before launching the software:

3.   Set to run as administrator

There can be some trouble importing data files if RKWard is not run as administrator (NOTE: This does not apply to systems running Windows XP). To permanently set that option, right-click the shortcut, select "Properties," and in the "Shortcut" tab (which is most likely what the Properties dialog opened to), click the "Advanced" button. In the window that appears, tick the "Run as administrator" box. Click "OK" on the windows to dismiss them. See Figure 1.
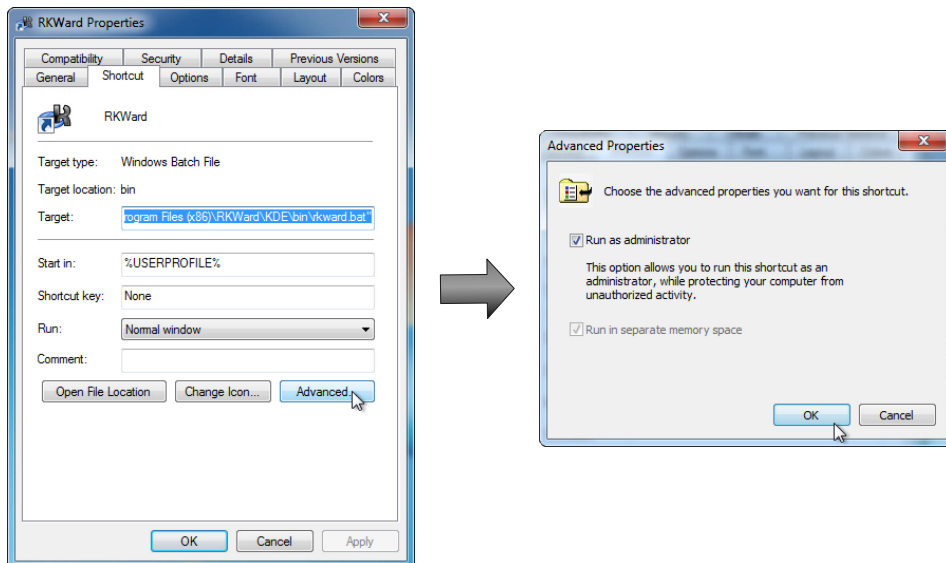

Figure 1. Setting the RKWard shortcut to run as administrator.

4.   Launch RKWard

Simply double-click the shortcut to launch the program. You will need to verify its permission to run as an administrator. You will also likely receive a pair of errors about a KDE file being unwritable, but I have yet to find any problem with this, and they only appear on the first run after install. Simply click "OK" to dismiss these (see Figure 2).
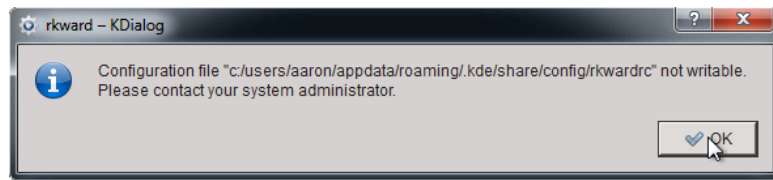
Figure 2. **One of two KDE error messages that may appear on the first run of RKWard. They can simply be dismissed.**

As soon as the software launches, a warning message will appear recommending that you disable native file dialogs (i.e., the familiar Windows file dialogs) for stability. The KDE file dialogs are not materially different from those of Windows, so there is no reason not to disable the native dialogs (see Figure 3).
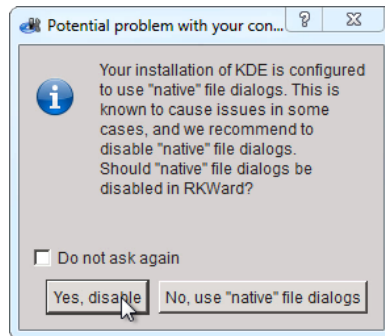

Figure 3. **Warning message regarding native file dialogs. Disable them.**

After disabling native file dialogs, the software will run normally. Skip ahead to the section on using RKWard.

MacOS X 10.7 "Lion" or 10.8 "Mountain Lion"

The process for installing RKWard on a Macintosh running one of the latest two versions of the Macintosh operating system is similar to that of Windows, although the download is considerably larger.

1.   Obtain the software

The RKWard project page for Windows can be found at the (shortened) URL below (or linked from the installation video on YouTube):

http://goo.gl/T6B9h

Scroll down the page to the section titled "Installing using the precompiled binary bundle (experimental!)". Although this method is officially experimental, I have used it on three Macintoshes without issue. If you are uncomfortable using an experimental installation method, the "proper" installation method is explained below in the section on installation on older Macintosh operating systems.

Click on the text "precompile a .dmg archive which includes KDE, R and RKWard" to visit the list of files for Macintosh.

You must download the approximately-915 MB file linked at the top of the page (see Fig. 4).
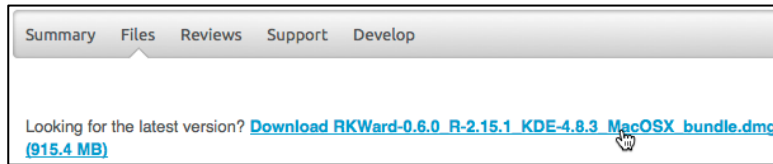
Summary   Files   Reviews   Support   Develop

Looking for the latest version? **Download RKWard-0.6.0_R-2.15.1_KDE-4.8.3_MacOSX_bundle.dmg (915.4 MB)**

Figure 4. **The precompiled installation bundle for MacOS X 10.7 and 10.8. Please open this link in a new tab.**

2.   Install the software

After the file downloads, simply mount the .dmg and double-click the installer, as you normally do to install software. (NOTE: If you are using OS X 10.8 "Mountain Lion", and you have Gate-Keeper enabled, you will need to right-click and select "Open" to start the installer.)

3.   Launch RKWard

You will now find a folder named "RKWard" in your Applications folder. Open this and start RKWard by double-clicking.

MacOS X 10.6 "Snow Leopard" or older

Installation on older Macintosh operating systems requires the following steps:

1. Installation of Xcode from the OS installation disc, or from one of the discs that shipped with the computer, and the installation of relevant updates

2. Installation of MacPorts from the project's web page

3. Setting up the environment from Terminal

4. Building RKWard from the Terminal (this process may take several hours, but you do not have to be present, and can use the computer for other things while it works)

5. Running final dbus terminal commands

6. Launching RKWard

I will not go into detail on this process here. This is the process by which I first installed RKWard, and it was not very difficult. If you are extremely uncomfortable with the terminal, it may not be for you. However, just as in the case above, most of the commands can simply be copy/pasted from the RKWard web page (linked above), and once the installation is complete, it works perfectly with no further tweaking. This process is also possible with later versions of MacOS X. If you are interested, please view my screencast on YouTube, which should demonstrate how feasible this approach actually is.

Using RKWard

Starting RKWard

(NOTE: All following screencaps are from a Macintosh running RKWard; however, because RKWard runs in the KDE environment, the usage and the vast majority of the visual elements are identical to those when running under Windows.)

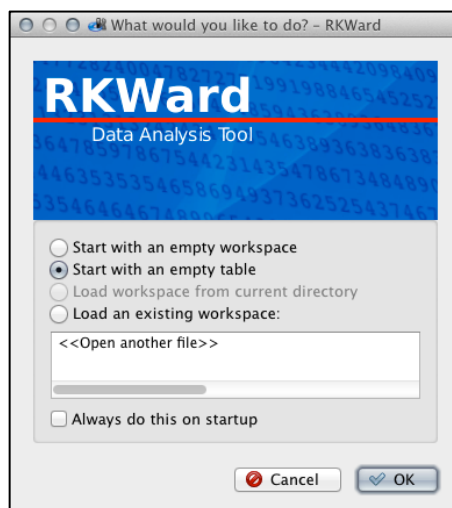Upon starting RKWard, you will be given a choice of startup options (see Figure 5):

Figure 5. **Starting RKWard.**

- *Start with an empty workspace.* This starts a new session with no data table. This is ideal for situations when you are starting a new analysis and will be importing data.

- *Start with an empty table.* This starts a new session with an empty data table into which you can type your data. Pasting is also ostensibly supported, but is frustrating, and not recommended.

- *Load workspace from current directory.* If you have a saved workspace in the directory that RKWard is using, you may use this option.

- *Load an existing workspace.* If you have saved a previous session (a workspace), it will appear in the list below this option. This is analogous to SPSS's feature for opening previous datasets, but is superior in that it will also load the outputs as well, in a separate tab. If you find yourself using RKWard frequently, this allows you to have a list of separate projects saved with all of their datasets and outputs saved together in workspace files.

The default is "Start with an empty table," but in most cases it will be easiest to start with an empty workspace and import your dataset, which you have already formatted elsewhere (e.g., in Excel, SPSS, Stata, and/or a text editor). Regardless of the choice you make on startup, you will be greeted with a welcome/documentation page.

Importing data

Importing text/CSV files

If you have your data in Excel (or another spreadsheet package), simply export it as CSV (comma-separated values) or a tab-delimited text file (see Batty, 2012 for detailed instructions on exporting from Excel).

To import your dataset, go to the File menu and select:

File → Import → Import format → Import Text / CSV Data

It is also possible to simply select "Import data" from the "Import" sub-menu, but I find that specifying the file time from the outset saves a step.

The "Import Text / CSV data" window opens (see Figure 6). Click the folder button next do the red-highlighted "File name" field. A file picker dialog will open, from which you can select your CSV or other text-format data file. In this example, I will be using a CSV file.
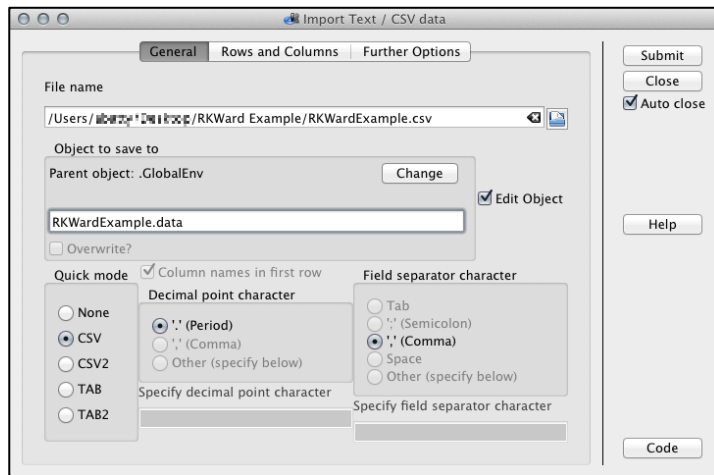

Figure 6. **"General" tab of the "Import Text / CSV data" dialog, with options set for a CSV data file.**

The "General" tab of the dialog has the following sections:

- *File name.* This is where you specify what file to load.

- *Object to save to.* This saves to the global environment by default (which is likely where you want to save your data), and allows you to rename the data table as it will appear in RKWard.

- *File format settings.* The bottom row of options tells RKWard how to read your data file. In most cases you can simply choose "CSV" or "TAB" and accept the default settings.

Other settings to help RKWard interpret your data file can be found on the "Rows and Columns" and "Further Options" tabs, but usually, as long as your variable names are in the top row of your text table, there is no need to change them.

After importing, you may change meta-information about the imported variables at the top of the data viewer (see Figure 7), although usually RKWard does a fairly job of understanding the data types upon import. This area has the following rows:

- *Name.* This is the short name for the variable.

- *Label.* Here you can specify a longer name/label for the variable.

- *Type.* There are four data types: Number (default), Factor (categorical data), String (nominal text), and Logical (true or false).

- *Format.* This is where you can change the alignment, number of decimals, etc.

- *Levels.* Levels of categorical variables.

In Figure 7, I am changing the type of my first variable to "Factor," because it represents students of four different ability levels, not continuous data ranging from 1 through 4.
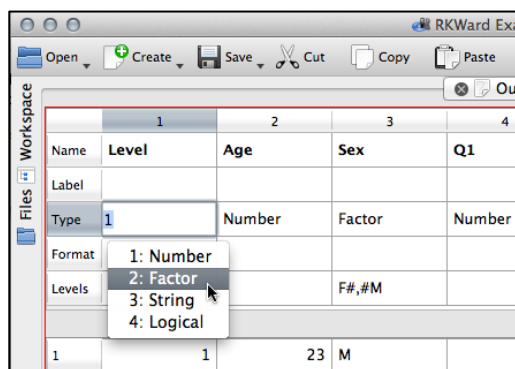
Figure 7. **The data-formatting section of the data table interface.**

Importing SPSS or Stata data files

Importing data files from other statistical applications is very straightforward, and follows the same basic procedure as importing text data files, but more information about the variables can be imported without RKWard having to interpret the data.

To import your dataset, go to the File menu and select:

$$\text{File} \rightarrow \text{Import} \rightarrow \text{Import format} \rightarrow \text{Import SPSS}$$

The workspace browser

When you start RKWard, the welcome message, output, or data table will likely take up the entire window, but there are several other panes that can be very helpful:

- *Workspace pane.* This can be found on the upper left-hand corner of the browser, and displays the active packages and datasets in the session (see Figure 8). They can also be removed, renamed, etc. from this pane, so I usually leave it open.

- *Files pane.* The button for this is directly below that for the workspace pane, and displays the contents of the current working directory.

- *Command log pane.* The button for this resides at the lower left-hand corner of the window, and displays a log of the commands RKWard is issuing to R in the background. This can be useful if you are familiar with R, but if not can be ignored.

- *R Console pane.* The button for this is directly to the right of that for the command log pane. This opens a miniature R console for running analyses using the command line. This is especially useful for using commands that have not been incorporated into RKWard yet, without leaving RKWard.

- *Help search pane.* The button for this pane is located directly to the right of that for the R console. It displays the help files for the various R packages, which is of limited use for RKWard users.

- *R engine status and interrupt.* In the lower right-hand corner of the window, there is an "R" in a colored box. If the box is green, the R engine is idle; if it is yellow, it is starting; if it is red, it is working. This is extremely useful for determining whether the reason a result has not appeared is due to a mistake, or if R is still calculating it. To the right of the indicator is

a stop button, which interrupts R. This is useful in cases when an analysis is taking too long and you wish to cancel it.
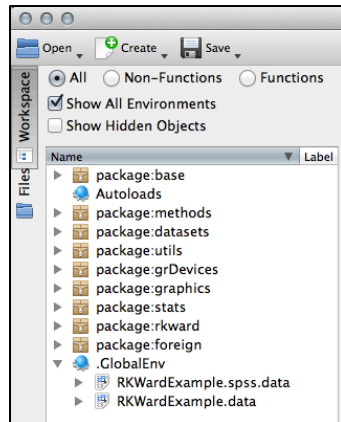

Figure 8. **Workspace pane.**

Running analyses and plots

All analyses are available from the "Analysis" menu, and are fairly straightforward to use. In cases where additional packages are necessary to run the analysis in question, a dialog will ask you to identify the nearest server, and download the required packages automatically. A wide variety of plots are also available under the "Plots" menu. Results will appear in the output tab.

t-tests

Since *t*-tests are extremely common, it is worth mentioning that RKWard does not allow independent sample *t*-tests of "long format" data, meaning two groups delineated by a value in a separate variable (e.g., "M" and "F"). To carry out this kind of analysis, place the values for the groups in their own variables (perhaps in different data tables to avoid confusion).

Exporting outputs

Unless you can use the results of analyses in other documents, they are of limited value. Luckily, RKWard's output file is HTML-formatted, making it very easy to work with. To export your output, Simply go to:

File → Export page as HTML

This will create an HTML file that can be opened in any browser to copy/paste out tables and/or graphics. It is important to note, however, that the graphics are located elsewhere on your computer, and you may want to make an additional copy of them before moving on to another project.

Saving your workspace

Finally, when quitting RKWard, it is a good idea to save your workspace. This preserves all the data, settings, packages, and outputs of your project in one small file, allowing you to return to it at any time. This function is accessible from the following:

Workspace → Save Workspace

The workspace can be saved anywhere you wish, and once it is saved, you can quit RKWard and return to it at any time.

Conclusion

This guide is intended to introduce a free, feature-packed software package for statistical analysis. It is hoped that this piece will encourage readers to install and explore the software over the next few months before the next issue of *SRB* is released, in which I will introduce the IRT functions available in RKWard via the LTM package for R.

References

Batty, A. O. (2012). Software Corner: jMetrik 2.1. *Shiken Research Bulletin*, *16*(1), 34–42.