

MIXREG for Windows

Overview

MIXREG is a program that provides estimates for a mixed-effects regression model (MRM) including autocorrelated errors. This model can be used for analysis of unbalanced longitudinal data, where individuals are measured at a different number of timepoints, or even at different timepoints. Autocorrelated errors of a general form (i.e. Toeplitz structure) or following an AR(1), MA(1), or ARMA(1) are allowable.

This model can also be used for analysis of clustered data, where the mixed-effects model does not assume that each observation is independent, but does assume data within clusters are dependent to some degree. The degree of this dependency is estimated along with estimates of the usual model parameters, thus adjusting these effects for the dependency resulting from the clustering of the data.

MIXREG uses a maximum marginal likelihood estimation, utilizing both the EM algorithm and a Fisher-scoring solution. For the scoring solution, the covariance matrix of the random effects is expressed in its Gaussian decomposition, and the diagonal matrix reparameterized using the exponential transformation. Estimation of the individual random effects is accomplished using an empirical Bayes approach.

The MIXREG user interface is relatively simple to use. Information about your data must be described to the program as laid out on four index cards:

- Configuration
- Variables
- Starting Values
- Missing Values

Then, with one click or keystroke, your estimates will be determined and the output displayed. A further click or keystroke allows you to print your output file. At any time, and in any order, you may alter the program settings describing your data.

To use MIXREG:

1. Click on the Configuration Card tab and enter the appropriate values. Note that any table can be maximized by double-clicking anywhere in the table. To minimize the table, simply double-click again.
2. Repeat (1) for each of the Variables, Starting Values and Missing Values.
3. When all data has been entered to your satisfaction, click on Run.
4. The output will be displayed. If you had chosen to have the Bayes Estimates written to a file, that file will also be shown when you close the output file. Both files can be viewed at any time by clicking on View Output or View Results.
5. To print the output, click on Print from the output viewer.

Each time you run an analysis, or exit from MIXREG, the current program settings will be written to the MIXREG.DEF file. Supposing you vary your settings, run an analysis and then realize the settings should not have been changed. As the MIXREG.DEF file now contains the latest settings, you will have to re-input the correct settings. A solution to this scenario is to save the settings in an additional definition file. To restore these settings, you simply indicate the name of this file as the definition file.

To create and save program settings values:

1. Enter your desired values in all program settings.
2. On the Configuration card, enter a name other than MIXREG.DEF as the Definition File.
3. Click on Run or Exit (this will save the values to the definition file you specified and to MIXREG.DEF).

To restore the values:

1. Click on the Configuration tab.
2. Enter the name of the file you specified above, as the Definition File.

The User Interface

All user-actions can be carried out by mouse or by using the keyboard. For brevity, the written documentation and on-line help are usually written with the intent of using the mouse. However, some of the corresponding keyboard and mouse actions are described below.

Note: The MIXREG window is a non-sizable window.

Using the mouse:

1. To access any index card simply click on the desired index tab (across the top of the screen).
2. To initiate the action of a command button, click directly on that button.
3. To access a field (which could be a table) click directly into that field. Tables can be maximized (or minimized) by double-clicking anywhere in the table
4. To use a list box, click on the arrow of the list box to view all available selections. Scroll through the list until your selection is found. Click on your selection.
5. To close down MIXREG, click on the Exit button.
OR Access the system menu by clicking once on the system icon (at the upper left corner of the window). Then click on the word 'Close'.
OR Double-click on the system icon.
6. To minimize the MIXREG window, access the system menu and click on the word 'Minimize'.
7. To maximize the MIXREG icon, click on the icon in the task bar, or double-click on the icon on the desktop (depending on your version of Windows).
8. To move the MIXREG window, hold down the mouse button while the mouse is over the title bar, drag the MIXREG window to your desired location, and then release the mouse.
9. To find out the version number of your copy of MIXREG, or the program credits, access the system and click on 'About MIXREG'.
10. To select a file from lists of existing files (see the Configuration Card steps 4, 5, or 6.)
 - a) While in a file setting of the Configuration Card, double-click to invoke the Select File dialog.
 - b) Click on the name of the desired file.
 - c) If the file is not present in the scrollable list, try looking elsewhere by opening (double-clicking on) other directory names. The default location is the directory where MIXREG has been installed.
 - d) If the file is still not present in the scrollable list, use the list box to show additional file types.
 - e) Click on OK to accept the file name. You will return to the Configuration card.
 - f) If you do not wish to continue with the file selection, click on Cancel. You will return to the Configuration card

Using the Keyboard:

1. To access any index card, press the `TAB` key to cycle through the present card until the desired index tab (at the top of the screen) has the focus. Press the `ENTER` key.
2. To initiate the action of a command button, press `TAB` and cycle through the present card until the desired button has the focus. Press `ENTER`.
3. Pressing the `SHIFT` key, followed by the `TAB` key will cycle through all fields of the present card in reverse order.
4. To access a field, press `TAB` repeatedly to cycle through the present card until the desired field has the focus. Note: The field could be a table.
 - There are two modes to table usage, movement and edit.
 - To use edit mode, press `ENTER` and you will be able to change the value in a table cell. Then press `ENTER` again to leave edit mode.
 - If you are not in edit mode, you can use the arrow keys to move about the various cells of the table.
5. To use a list box, press `TAB` to move to the list box. Press the arrow keys to move through the available selections until your choice is found.
6. To close down MIXREG, press `TAB` until the Exit button has the focus. Press `ENTER`.

Command Buttons

The following command buttons are accessible from any index card so that you have the most flexibility in using the program.

Exit

If you would like to end your MIXREG session, click on the Exit button. The position of the MIXREG window will be saved if you ended the session while the window was maximized (that is, not minimized to an icon).

All information currently present in the program settings will be saved in the MIXREG.DEF file (as well as the file of your choice if you have identified another file as the Definition File).

Run

When you click on the Run button the data specified in your input file and the current program settings are used to determine the estimates for mixed-effects regression model (MRM) including autocorrelated errors. The current program settings will be stored to the file specified by the Definition File and to MIXREG.DEF (if that is not the Definition File).

The outcome of the analysis is saved to the file specified by the Output File and, if applicable, the Results File. Both files can be named on the Configuration Card. The file(s) will be automatically displayed; first the Output File and then the Results File. After you have viewed the file(s), you can return to the index cards and alter the values if desired. The outcome can be viewed at any time by clicking either View button.

View

Clicking on either View button will allow you to look at the outcome of your analysis. The files displayed are the ones specified by the Output File and the Results File on the Configuration Card. The Results file is only generated if the write Bayes estimate option on the Configuration Card is set to yes. In this case it will contain the empirical Bayes estimates of the random effects for each level-2 unit. After you have viewed the file(s), you can return to the index cards and alter the values if desired.

If either file does not exist, MIXREG will prompt you to check the path of the output file listed. If the file field is completely blank, the viewer will show you an empty file.

View is automatically executed after selecting Run. The Output File will be displayed, followed by the Results File. To print either file, click on Print from the View Window.

Default

When you start MIXREG up, it will appear with the program settings as they are defined in the MIXREG.DEF file. If the MIXREG.DEF file is not present on your computer, the program settings will be defined with a set of default values. These default values are among the most commonly used and provide a good starting point for entering data. If you would like to use these values, click on the Default button.

Since selecting the Default button will change all of your current program settings, a confirmation message will appear asking if you wish to change your values. Click on Yes to continue, or No to cancel the operation.

If you wish to permanently save your current (non-default) values, it is necessary to store them in another definition file. See the first page of MIXREG for Windows, for more information about creating and restoring program settings.

Help

MIXREG provides a complete on-line help facility. Click on the Help button to access the help information for that card. Also, pressing F1 will display the help information for that card unless the focus is on a command button. If this is the case, you will be shown the help information for that command.

Once you have entered Help you can move to any topic page. Click on the Contents button at the upper left corner of the window to display the opening screen of Help. From the opening screen you can obtain step by step instructions for using any command or card of MIXREG.

To leave Help and return to your originating position in MIXREG, select Exit from the File Menu.

Index Cards

The program settings used by MIXREG are described on five index cards, Configuration, Variables, Starting Values, Missing Values and Advanced. When MIXREG starts, it will appear with the program settings that are defined in the MIXREG.DEF file. If the MIXREG.DEF file is not present on your computer, the program settings will be given a set of default values. For more information on the default values, see the Default Command Button.

Configuration

To define Configuration program settings:

1. Click on the Configuration tab.
2. Enter the title of your choice as the main title. The maximum length is 60 characters; longer titles are automatically clipped.
3. Enter the subtitle of your choice. The maximum length is 60 characters; longer titles are automatically clipped.
4. Enter the name and path of the file which is to be used for saving and restoring all program settings. If you use a name other than MIXREG.DEF, all your program settings will be saved to both files.
OR Double-click in the field for selection from a list.
5. Enter the name and path of the file where the output of the analysis should be written.
OR Double-click in the field for selection from a list.
6. Enter the name and path of the file from which the data should be read.
OR Double-click in the field for selection from a list.
7. If the write Bayes estimate option has been set to **yes**, enter the name and path of the file to where the results should be written.
OR Double-click in the field for selection from a list.
8. Enter the number of data fields to be read from your input file.
9. Use the list box to indicate if the Bayes estimates should be written out. You may choose **yes** or **no**.
If you choose **yes**, an additional file field will appear above (see step 7). Enter the name and path of the file to where the results should be written.
10. Enter the number of EM iterations to perform prior to Fisher scoring iterations. It is usually set to 10 or 20.
11. Enter your convergence criterion. It is usually set to 0.001 or 0.0001
12. Enter the number of individuals whose data will be listed on screen; it is usually set to 1.
13. Indicate the field of your input file which contains the level-2 unit IDs.

14. Use the list box to indicate how autocorrelation should be handled. You may choose **no AC term**, **fix AC term** or **estimate all**.
If you choose anything other than **no AC term**, a list box will appear from which you must select the Error Form. Several choices are available.
15. If you require an Error Form (see step (14)) and choose **General Autocorrelation** or **Smoother General** from the list box, a field will appear for the number of autocorrelation terms. You may enter up to 10 terms.
16. Use the list box to indicate if you wish to reparameterize the variance terms during the Fisher scoring solution. You may choose **yes** or **no**.
17. Indicate the field of your input file which contains the dependent variable.
18. Enter the text of your choice as the dependent variable label. You may enter up to 8 characters.

Variables

Within the Variables card, the following settings may require additional information, depending on what values are entered:

- Number of Random Effects
- Number of Fixed Effects
- Number of Timepoints
- Generate Table of Means

If more information is required, a table will appear (or become larger). The number of rows of the table will depend on the value entered. If there is insufficient space to display all rows of the table, scroll bars will automatically appear.

Tables can be maximized (similarly, minimized) by double-clicking anywhere in the table.

To define Variables program settings:

1. Click on the Variables tab.
2. Enter the number of random effects. The maximum number of random effects is 8. Press **TAB**. If a non-zero value was entered, a table will appear. For each random effect, enter its field from your input file and its label. As before the maximum length of the label is 8 characters.
3. Enter the number of fixed effects. The maximum number of fixed effects is 40. Press **TAB**. If a non-zero value was entered, a table will appear. For each fixed effect, enter its field from your input file and its label. As before the maximum length of the label is 8 characters.
4. If autocorrelation (see the Configuration Card) was set to **fix AC term**, or **estimate all**, additional information is required about the time variable.
 - a) Enter the field of your input file which contains the time variable.
 - b) Enter the maximum number of timepoints the time variable can take on in the data. You may have 0 to 36 timepoints. Press **TAB**.
 - c) If a non-zero value was entered, a table will appear. For each timepoint, enter its value.
5. Use the list box to indicate if a table of means of the dependent variable broken down by the values of another variable is to be generated. You may choose **yes** or **no**.

If you choose **yes** additional fields will appear:

- a) Enter the field of your input file which contains the variable for which the means of the dependent variable will be broken down by.
- b) Enter the number of levels for the variable being used to break down the dependent variable. You may have 0 to 20 levels. Press **TAB**.
- c) If a non-zero value was entered, a table will appear. For each level, enter its value.

Starting Values

To define Starting Values program settings:

1. Click on the Starting Values tab.
2. Use the list box to indicate the type of starting values. You may choose **automatic** or **user-defined**.

If you select **user-defined** additional fields will appear:

- a) Enter the starting value for the error variance.
- b) If you had a non-zero number of random effects (see the Variables card) you must fill the table with the starting values for the means of the random effects.
- c) If you had a non-zero number of explanatory variables (see the Variables card) you must fill the table with the starting values for the effects of the covariates.
- d) If you had a non-zero number of random effects, you must fill the table with the starting values for the variances and covariances of the random effects.
- e) If autocorrelation (see the Configuration Card) was set to **fix AC term**, or **estimate all**, you must fill the table with a starting values for the autocorrelation term. It must lie between -0.99 and 0.99, inclusive. If the error form (see the Configuration Card) was set to **General Autocorrelation**, you must indicate that there was more than one autocorrelation term. If this is the case, the starting value table will show fields for all the terms and must be filled completely.

Missing Values

To define Missing Values program settings:

1. Click on the Missing Values tab.
2. Use the list box to indicate whether there are missing values. You may choose **true** or **false**.

If you select **true** additional information is required:

- a) Enter the missing value code for the dependent variable.
- b) If you had a non-zero number of random effects (see the Variables card) you must fill the table with the missing values codes for the random effects.
- c) If you had a non-zero number of explanatory variable effects (see the Variables card) you must fill the table with the missing value codes for the fixed covariates.

Printing from within MIXREG

From the View option, clicking on Print will invoke the Windows Print Dialog from where you can begin printing. Since this dialog box is shared amongst all printing tasks, selections that are not applicable to MIXREG are greyed out.

The following information is displayed:

- The default printer. If you wish to change the default printer, click on Setup (see Print Setup).
- The print range set to All. This cannot be changed.
- The print quality.
- The number of copies.

To print:

1. Check that the printer is correct.
2. Verify that the quality is correct, or use the list box to change the quality.
3. Indicate the number of copies.
4. Begin printing by clicking on OK.

Note: Output will always be printed with portrait orientation.

To cancel printing:

If you wish to abort a print job, you must do so from within Print Manager. Do not use the Escape key; MIXREG will ignore it. For further information about Print Manager, consult your Windows reference materials.

Print Setup

The Print Setup dialog will display the default printer settings as they are defined in your **Windows installation**. Take care when using this option! If you make any changes in this dialog box, it will affect the operation of other Windows applications yet MIXREG may not recognize it.

The following information is displayed:

- **Orientation:** MIXREG will always issue its output in portrait orientation, even if you change the orientation in the Setup dialog. So, if you choose landscape, MIXREG output will still appear in portrait form, yet output from other Window's applications may appear in landscape.
- **Printers:** The only change that MIXREG will act upon is the choice of printer. But again, changing the printer in MIXREG will cause the printer settings in other Windows applications to change as well.