

# Introducing L<sup>A</sup>T<sub>E</sub>X and Sweave

Marc and Kyle

May 14, 2019

## 1 What is L<sup>A</sup>T<sub>E</sub>X?

L<sup>A</sup>T<sub>E</sub>X is an open source word processor that produces high quality documents. In addition, R commands can be integrated into text to ‘weave’ data analysis, graphics, and text into a professional finished product.

### 1.1 Why use L<sup>A</sup>T<sub>E</sub>X?

TBD

## 2 Using R Studio

Before using L<sup>A</sup>T<sub>E</sub>X, we need to define how files are ‘knited’ to create pdf files. After starting R studio, choose the ‘Tools’ menu item and select global options. On the left, select the ‘Sweave’ option and make sure the default values match Figure 1.

## 3 Creating L<sup>A</sup>T<sub>E</sub>X Documents

### 3.1 Document Structure: Preamble

We usually declare the type of document on the first line of the text file, using the command `\documentclass{}`. Inside the curly brackets we specify the type of document that you want, e.g. `article`, `letter`, `book`, `minimal`, or `memoir`. In general, I recommend you begin with `article`.

### 3.2 Title and Author

The author and title are specified in the preamble with the following commands:

```
\title{This is my title}  
\author{This is the author or list of authors}
```

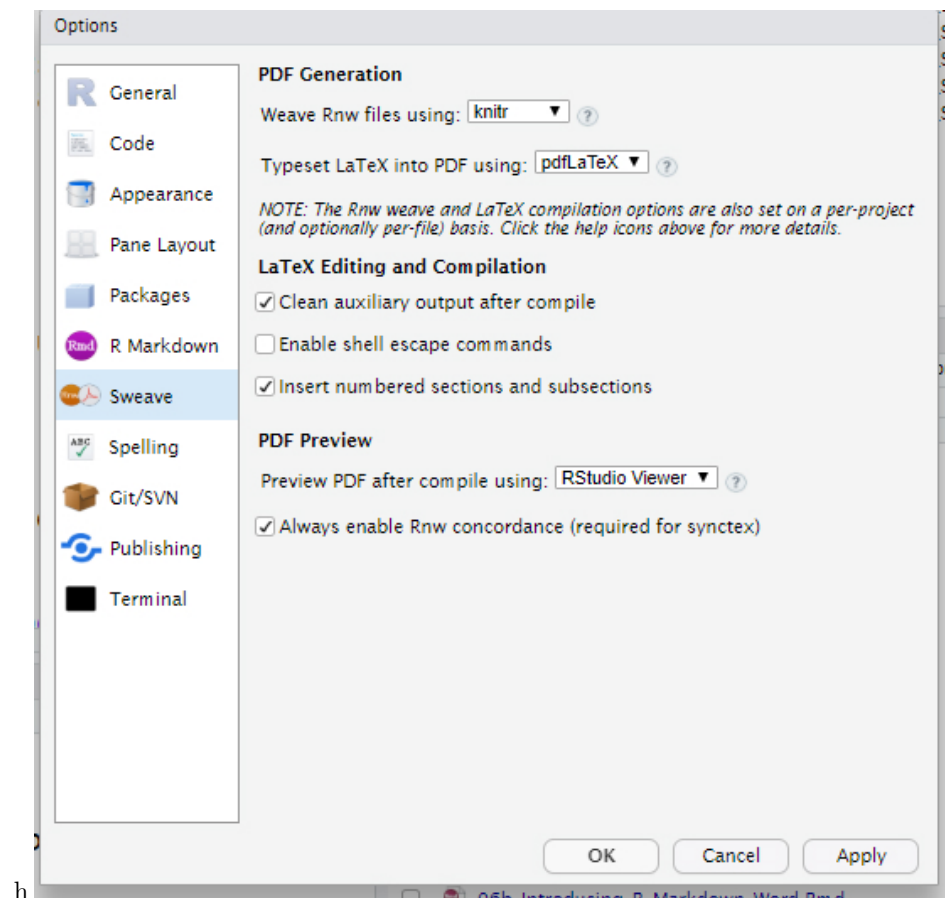


Figure 1: Sweave setup screen shot

### 3.3 Begin and End

Special blocks are developed within `\begin{}` and `\end{}` commands. For every block, both the begin and end must be present or you will generate errors.

In fact, after the preamble, the documents text is initiated by the `\begin{document}` and ends at `\end{document}`.

### 3.4 Printing the Title and Author

After the `\begin{document}` is a good time to print the title, author and date of the pdf, which is all done with a `\maketitle` command.

### 3.5 Sections and Subsections

Each section and subsection (and subsubsection) heading are hierarchically defined and specified with the following commands:

```
\section{This is a section heading}
\subsection{This is a subsection heading}
\subsubsection{This is a subsubsection heading}
```

Please note, if you define a section, there must be more than one. Similarly, if you create a subsection, be sure that it's not alone in the section – otherwise, why have the break at all!

Finally, try to avoid putting text between dropping down into categories. In other words, don't insert a paragraph between a section and a subsection. Define the subsection so that the paragraph is applicable to the subsection and the section.

### 3.6 Special Characters that Cause Problems

Most special characters are reserved for L<sup>A</sup>T<sub>E</sub>X type setting – see table for some important ones. These often create errors for beginners and experienced users alike, but for beginners the frustration generated by these errors can be overwhelming!

Review Table 1 to appreciate some of these characters (Table 1).

If you are trying to use the characters in the text, then put a backslash in front of them. If you are using them in a type-setting capacity, you should look up how to use them online.

The symbol issues listed above are relatively easy to address. The more difficult problem is if you use

Table 1: Write a Caption here.

Character	Type Setting Function	Associated Error
%	Percent symbols used to make comment lines and are not printed when compiled.	If you want to print the percent symbol, use \%
&	Ambersands are used for tab in tables	When used outside the table environment, you'll get errors, use \& if you want to use the symbol in writing.
\$	Dollar symbols are use to create 'math' mode blocks, for example if you want to use the Greek letter $\alpha$ , <code>\alpha</code>	If you really want a dollar sign, then you'll want to use <code>\\$</code> .

## 4 Integrating R Commands with Sweave

### 4.1 Compile PDF workflow

Now the best part of using  $\text{\LaTeX}$  and Rstudio is that you can create text that runs the R code as you compile and even use the results in the text.

We begin with an Rnw File. When we 'Compile PDF', Rstudio routes the file through a Sweave processe to create a  $\text{\TeX}$ file. The  $\text{\TeX}$ file is then compiled into a pdf.

Rnw  $\rightarrow$   $\text{\TeX}$   $\rightarrow$  PDF

### 4.2 R Chunks

R chunks or blocks are delineate with the following code:

```
<<>>=
... R code stuff
@
```

Within the less than and greater than sybols, one can customize how the R block is processed. For more information, one should see other more detailed resources.

### 4.3 Creating Figures

We intiate figures with `\begin{figure}` and ends with `\end{figure}`. For more information, the reader is directed to one of several online resources on R and  $\text{\LaTeX}$ .

## 4.4 Creating Bibliography

To create a bibliography, we need to add some packages, for example, `\usepackage{natbib}` into the preamble. We also make sure the bibliographic style is defined for the Council of Scientific Editors by making sure the `cbe.bst` file is in the home directory.

To cite in text you can use one of two commands `\citep{}` and `\citet{}`. Inside you curly brackets you use the citation 'key' to reference each citation. Finally you'll add `\bibliographystyle{cbe.bst}` and `\bibliography{bibtexfile}` just before the `\end{document}` line.

## 5 Minium Working Document

I have created a minimum working document and sample bib file that you can upload to R studio server, save with a new name and compile. If it compiles correctly, you are on your way.

Here are the URLs:

[https://github.com/marclos/Climate\\_Change\\_Narratives/blob/master/Communication\\_Resources/Lab\\_Report\\_Template.Rnw](https://github.com/marclos/Climate_Change_Narratives/blob/master/Communication_Resources/Lab_Report_Template.Rnw)

[https://github.com/marclos/Climate\\_Change\\_Narratives/blob/master/Communication\\_Resources/bibexample.bib](https://github.com/marclos/Climate_Change_Narratives/blob/master/Communication_Resources/bibexample.bib)

[https://github.com/marclos/Climate\\_Change\\_Narratives/blob/master/Communication\\_Resources/cbe.bst](https://github.com/marclos/Climate_Change_Narratives/blob/master/Communication_Resources/cbe.bst)

Be sure to upload all three files or you won't be able to compile the document.