Agricultural Production and Technological Change

How to LaTeX

Alexandra E. Hill

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Colorado State University

What is LaTeX

Pronounced "Lay-tek" or "Lah-tek."

It is a "document preparation system for high-quality typesetting... [it] encourages authors not to worry too much about the appearance of their documents but to concentrate on getting the right content."

In LaTeX your document is a plain text file interspersed with *commands* used to express the desired (*typeset*) results.

To produced a final typeset document, you need a *TeX engine*.

$\Rightarrow$ You focus on *content*, TeX engine will take care of *formatting*.

Why Use LaTeX

Typesetting of complex mathematical formulas (made easy)

Cross-referencing of tables, figures, sections, citations, everything!

Automatic generation of bibliographies

Short-run time sink $=$ long-run time gains

Highly customizable and many free templates:

- AEA
- The Econometric Society
- AJAE
- Food Policy
- Many many more!

Overview

Getting Started

Step 1: Declare a document *class* – https://www.ctan.org/topic/class

Step 2: Begin and end your document using \begin{} and \end{}

Step 3: Write something in the *body* of your document.

```
\documentclass{article}
\begin{document}
First document. This is a simple example, with no
extra parameters or packages included.
\end{document}
```

Now you have a LATEXdocument!

Preamble (basics)

Everything entered before \begin{document} is called the *preamble*.

This is where you customize/format/set up your document.

This is also where you load *packages* using \usepackage{}.

This is also where you indicate your title, authors, abstract, etc. in the article class.

Preamble (basics)

```latex
\documentclass[12pt]{article}
\usepackage{amsmath, amsthm, amssymb} % load common math packages
\title{Some Clever Paper Title}
\author{Alexandra E. Hill\thanks{Colorado State University}}
\date{\today}
...
\begin{document}
\maketitle
...
```

Note that sometimes you will need to download packages when using a native program.

But you shouldn't have to do this on overleaf.

Basic Text Formatting

Bold text using \textbf{}

Italicize text using \textit{}

<u>Underline</u> text using \underline{}

You can also *italicize* using \emph{}...
this will also *remove italics when used inside* \textit{}
and **add italics when used inside** \textbf{}

Basic Document Formatting – Lists

LaTeXsupports unordered, ordered, customized, and nested lists:

- This is an unordered list.
- \begin{itemize}

1. This is an ordered list.
2. \begin{enumerate}

- This is a customized list
- \begin{itemize} and \renewcommand{\labelitemi}{$\blacksquare$} or \item[$\blacksquare$]

Basic Document Formatting – Nested Lists

- This is a default nested unordered list.
  - Just keep using \begin{itemize}
    - Just keep using \begin{itemize}

- This is a default nested ordered list.
  1. Just keep using \begin{enumerate}
     1.1 Just keep using \begin{enumerate}

- You can also customize each nest
  - I \renewcommand{\labelitemii}{\Roman{enumii}}
    a. \renewcommand{\labelenumiii}{a.}
    (a) \begin{enumerate}[(a)]
     B \item[B]

Basic Document Formatting – Paragraphs & Separations

New paragraphs: "enter" twice. (note: indented)

New lines: \\ or \newline

Extra spacing:

```
\usepackage[skip=10pt plus1pt, indent=40pt]{parskip}
% the parskip package can set paragraph and indent spacing

\usepackage{setspace} % the setspace package lets you use the commands
% \singlespacing, \onehalfspacing and \doublespacing in the preamble
\begin{spacing}{2.5}
...
\end{spacing}
```

Basic Document Formatting – Sections and Structure

The relevant classes for a research paper include:

- \section{section name}
- \subsection{subsection name}
- \subsubsection{subsubsection name}
- \paragraph{paragraph name}
- \appendix followed by \section{section name}
- You can automatically populate a table of contents using \tableofcontents

You can suppress the numbering using the *starred version*, e.g.
\section*{section name}

Math!

One of the main advantages to LATEXis the ease or writing and labeling mathematical expressions.

Inline math mode is used for writing formulas within the body of a paragraph. For example, $Y = AL^\beta K^\alpha$.

To typeset inline-mode math you can use one of these delimiter pairs:
`\( ... \)`, `$ ... $` or `\begin{math} ... \end{math}`

Math!

```
\documentclass[12pt]{article}
\begin{document}
\textit{Inline} math mode is used for writing formulas within the body
of a paragraph. For example, $Y=AL^\beta K^\alpha$ is the same as
\(Y=AL^\beta K^\alpha\) is the same as
\begin{math}Y=AL^\beta K^\alpha\end{math}.
\end{document}
```

Inline math mode is used for writing formulas within the body of a paragraph. For example, $Y = AL^\beta K^\alpha$ is the same as $Y = AL^\beta K^\alpha$ is the same as $Y = AL^\beta K^\alpha$.

Math!

One of the main advantages to LaTeX is the ease or writing and labeling mathematical expressions.

Display math mode is used for writing formulas that are typeset on separate lines.

To typeset display-mode math you can use one of these delimiter pairs:

```
\[ ... \], \begin{displaymath} ... \end{displaymath} or
\begin{equation} ... \end{equation}
```

Math!

```
\begin{equation}
Y=AL^\beta K^\alpha
\end{equation}
```

$$Y = AL^{\beta}K^{\alpha} \tag{1}$$

Math!

You can suppress the numbering using the *starred version*, e.g. \begin{equation*}

$$Y = AL^{\beta}K^{\alpha}$$

I am also a fan of the *align* environment:

```
\usepackage{amsmath} % add this to preamble to use align
\begin{align*}
x&=y            &  w &=z                & a&=b+c\\
2x&=-y          &  3w&=\frac{1}{2}z     & a&=b\\
-4 + 5x&=2+y    &  w+2&=-1+w            & ab&=cb
\end{align*}
```

Math!

$$x = y \qquad\qquad w = z \qquad\qquad a = b + c$$

$$2x = -y \qquad\qquad 3w = \frac{1}{2}z \qquad\qquad a = b$$

$$-4 + 5x = 2 + y \qquad\qquad w + 2 = -1 + w \qquad\qquad ab = cb$$

Math!

Split is also quite useful:

```
\begin{equation} % note split also requires amsmath
\begin{split} % this will only assign one number to the entire equation
Y & =AL^\beta K^\alpha^^I\\
 & = A\cdot L^beta \cdot K^\alpha
\end{split}
\end{equation}
```

$$
\begin{aligned}
Y &= AL^\beta K^\alpha \\
&= A \cdot L^\beta \cdot K^\alpha
\end{aligned}
\tag{2}
$$

Here is a pretty complete list of math symbols: https: //www.overleaf.com/learn/latex/List_of_Greek_letters_and_math_symbols

Figures

```
\usepackage{graphicx} % need this package for figures
\graphicspath{{images/}} % specify figure location
\begin{figure}[h] % note [h] indicates where to place the figure
\includegraphics[width=0.85\textwidth]{symbols}\\
\caption{A few \LaTeX symbols}
\end{figure}
```

description	code	examples
Greek letters	\alpha \beta \gamma \rho \sigma \delta \epsilon	$\alpha\ \beta\ \gamma\ \rho\ \sigma\ \delta\ \epsilon$
Binary operators	\times \otimes \oplus \cup \cap	$\times\ \otimes\ \oplus\ \cup\ \cap$
Relation operators	< > \subset \supset \subseteq \supseteq	$<\ >\ \subset\ \supset\ \subseteq\ \supseteq$
Others	\int \oint \sum \prod	$\int\ \oint\ \sum\ \prod$

Figure 1: A few LaTeX symbols

Figures

LATEX will automatically move float objects around "optimally," but you can also control where they go
https://www.overleaf.com/learn/latex/Positioning_of_Figures

You might also need to use subfigures at some point...
https://www.overleaf.com/learn/latex/How_to_Write_a_Thesis_in_LaTeX_
(Part_3)%3A_Figures%2C_Subfigures_and_Tables

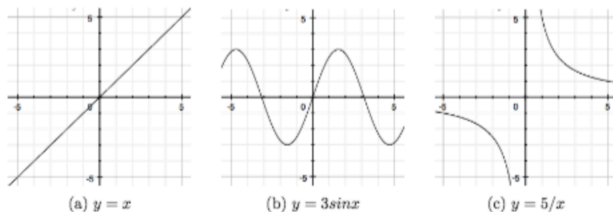(a) $y = x$ (b) $y = 3sinx$ (c) $y = 5/x$

Figure 3.1: Three simple graphs

Tables

```
\begin{tabular}{c c c}
 cell1 & cell2 & cell3 \\
 cell4 & cell5 & cell6 \\
 cell7 & cell8 & cell9
\end{tabular}
```

cell1	cell2	cell3
cell4	cell5	cell6
cell7	cell8	cell9

Tables – booktabs for nicer tables

```
\begin{tabular}{c c c}
\toprule
header1 & header2 & header3 \\ \toprule
 cell1 & cell2 & cell3 \\ \midrule
 cell4 & cell5 & cell6 \\ \bottomrule
\end{tabular}
```

header1	header2	header3
cell1	cell2	cell3
cell4	cell5	cell6

Tables

A nice guide on making good looking tables:
https://people.inf.ethz.ch/markusp/teaching/guides/guide-tables.pdf

I think every program lets you export results into nicely formatted LATEXtables.

https:
//medium.com/the-stata-guide/the-stata-to-latex-guide-6e7ed5622856

https://vivdas.medium.com/
create-latex-and-ms-word-tables-in-r-6ac919204247

Labeling and Cross-referencing

One of the nicest features of LaTeXis the ability to really easily cross-reference anything.

```
\begin{table} \caption{A crappy table} % add a title
\label{tab:crap_table}
\begin{tabular}{c c c}
\toprule
header1 & header2 & header3 \\ \toprule
 cell1 & cell2 & cell3 \\ \midrule
 cell4 & cell5 & cell6 \\ \bottomrule
\end{tabular}
\end{table}
```

Labeling and Cross-referencing

Once I have labeled a float I can reference it using \ref{}. From our example below I would reference table 1 as \ref{crap_table}.

Table 1: A crappy table

header1	header2	header3
cell1	cell2	cell3
cell4	cell5	cell6

This means if I add, remove, or reorder anything I never have to go through my document changing reference numbers!

Labeling and Cross-referencing

I can also do this for (display) equations

```
\begin{equation}\label{eq:c-d}
Y=AL^\beta K^\alpha
\end{equation}
```

Equation \ref{eq:c-d} is the Cobb-Douglas production function.

$$Y = AL^\beta K^\alpha \tag{3}$$

Equation 3 is the Cobb-Douglas production function.

Labeling and Cross-referencing

I can also do this for:

- Sections, subsections, etc. \section{Results}\label{sec:results}
- Figures \begin{figure}\caption{Something Cool}\label{fig:cool_fig}
- And of course... references!!

Reasons BibTEXis AWESOME:

- automatically includes and excludes citations based on what you actually cite
- allows you to quickly and easily adhere to different bibliography *styles*
- usually you can download BibTEX-formated citations direction from journals
- you can also use a citation manager (I use Mendeley, people also like Zotero)

Bibliographies – BibTeX

How BibTeXworks:

1. Create a bibliography file – just create a new file with a '.bib' extension
2. Add a bibitem
3. Add the following to your document:

   ```
   \usepackage{natbib} % I prefer this package, but this isn't necessary
   \bibliographystyle{apalike} % We choose the "apa" reference style
   \bibliography{refs.bib} % Entries are in the refs.bib file
   ```
4. Cite something using \citet{} or citep{}

Bibliographies – Example BibTeXitem

```
% @article indicates the type of bibitem, the term following it is the iter
@article{Burke2021,
title = {The changing risk and burden of wildfire in the United States},
journal = {Proceedings of the National Academy of Sciences},
volume = {118},
number = {2},
pages = {e2011048118},
year = {2021},
doi = {https://doi.org/10.1073/pnas.2011048118},
author = {Marshall Burke and Anne Driscoll and Sam Heft-Neal and Michael Wa
}

In the document I can cite this item using \citep{Burke2021}.
```

Bibliographies – Example BibTeXitem

Let's try pulling a bibitem from a journal...
https://onlinelibrary.wiley.com/doi/full/10.1093/ajae/aav013