

L^AT_EX Tutorial

Lingchao Meng

School of Economics
Peking University

April 26, 2020

This is just a beginner guide to writing documents in \LaTeX without prior knowledge of \LaTeX . This slide is designed for the \LaTeX workshop at School of Economics, Peking University.

This file and some other materials can be download from my GitHub repository: https://github.com/MengLingchao/LaTeX_tutorial. Please feel free to download and use it. If you want, you can also star it!

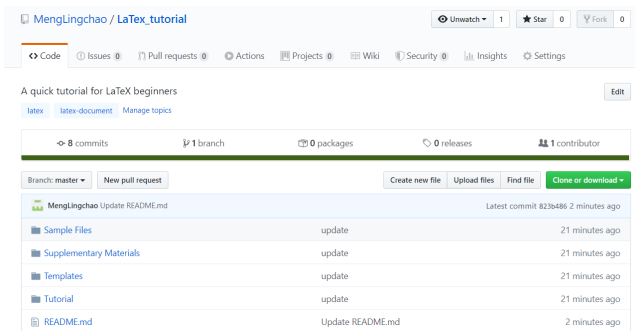


Figure 1: GitHub Repository

Outline

- 1 Introduction
- 2 L^AT_EX Basic
- 3 Basic Typesetting
- 4 Equations
- 5 Tables and Figures
- 6 Bibliography
- 7 Conclusion

Introduction

What's L^AT_EX?

L^AT_EX (pronounced either “Lay-tech” or “Lah-tech”)

- is based on T_EX, a typesetting system designed by Donald Knuth in 1978 for high quality digital typesetting.
- is a *typesetting system* and *programming language*, not a *word processor*.

```
1 This is \textbf{my} \emph{
  {first} document
  prepared in \LaTeX. I
  \underline{typed} it
  on \today.
```

This is **my** *first* document prepared in L^AT_EX. I typed it on April 26, 2020.

Why L^AT_EX?

- Donald Knuth says that his aim in creating T_EX is to beautifully typeset *technical documents* especially those *containing a lot of Mathematics*.
- Most English journals have their own L^AT_EX template or accept L^AT_EX submission. L^AT_EX is widely used in English paper writing.
- Even for ordinary text, L^AT_EX is also a good choice.

Installation

On Windows, users have two main choices of TeX system to install: **TeX Live** or **MiKTeX**. I highly recommend Tex Live for the following reasons

- The standard installer for MiKTeX installs 'just the basics' and uses on-the-fly installation for anything else you need; the standard install for TeX Live is 'everything' (about 4.5 Gb!).
- Real-time updates.
- Faster compilation (especially in case of graphics files)

Installation

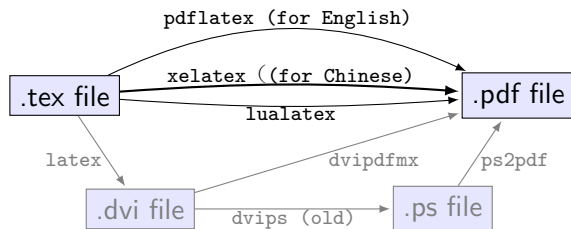
There are many different editors of \LaTeX .

- professional \LaTeX editors, such as TeXstudio, TeXwork.
- edit \LaTeX files using Vim, Sublime Text, Visual Studio Code, etc.
- For more comparison of \LaTeX , you can refer to https://en.wikipedia.org/wiki/Comparison_of_TeX_editors

Recommend Tex Live with TexStudio, you can refer to <https://blog.csdn.net/zywhehe/article/details/83113214>.

Aside: you may change the default compiler to **pdfLaTeX** through Options-Configure TeXstudio-Build

From .tex file to .pdf file



Installation

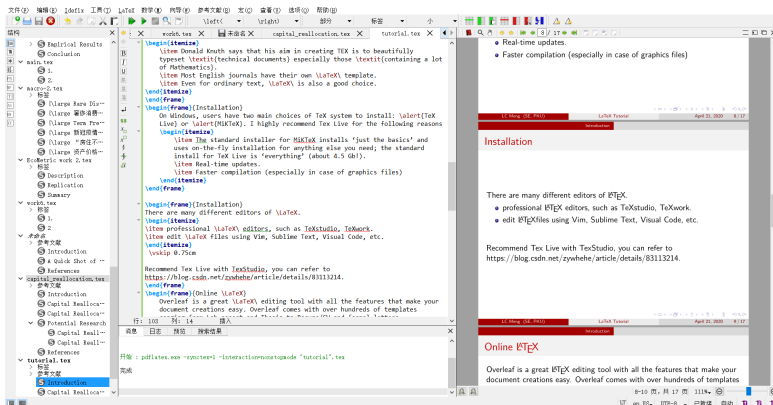


Figure 2: TeXstudio

Online L^AT_EX

Overleaf(<https://www.overleaf.com/>) is a great L^AT_EX editing tool with all the features that make your document creations easy. Overleaf comes with over hundreds of templates ranging from Lab report and Thesis to Resume/CV and formal letters.

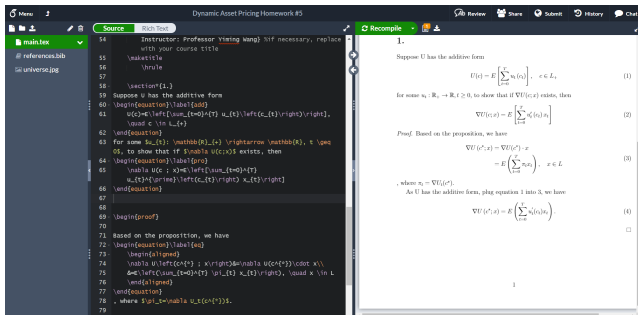


Figure 3: Overleaf website

LaTeX Basic

The basic structure of a L^AT_EX file

- ① The *documentclass* command: define the property of the file
 - article, beamer, report, thesis, letter, book
- ② Preamble
 - include the packages: `\usepackage{package}`
 - format the article.
- ③ Begin and end of the document: the main body of the file.

```
\documentclass[options]{article}  
Preamble (for LATEX commands only)  
\begin{document}  
Document text (text with embedded LATEX commands)  
\end{document}
```

Document Structure

L^AT_EX is extremely suitable for *well-structured* article.

- ① Title: `\title{} \author{} \date{}... ⇒ \maketitle`
- ② Abstract: `\begin{abstract}...\end{abstract}`
- ③ Contents: `\tableofcontents`
- ④ Sections: `\section \subsection...`
- ⑤ Appendix: `\appendix`
- ⑥ References: `\bibliography{}`

Document Structure

L^AT_EX can organize, number, and index chapters and sections of document. There are up to 7 levels of depth for defining sections depending on the document class

- ① `\part{title}`: the highest level
- ② `\chapter{title}`: the highest level of report, book class
- ③ `\section{title}`: the highest level of article
- ④ `\subsection{title}`
- ⑤ `\subsubsection{title}`
- ⑥ `\paragraph{title}`: not numbered
- ⑦ `\subparagraph{title}`: not numbered

L^AT_EX vocabulary

- **Commands:** produce text or space, like `\textit{it}`.
- **Declarations:** affect the following text, like `\Large` or `{\Large }`.
- **Environments:** receive special processing and are defined by `\begin{name} ... \end{name}`.
- **Mandatory arguments:** are included in braces, like `\hspace{2in}`.
- **Optional arguments:** are enclosed in brackets `[]`, like `\documentclass[11pt]{article}`.
- *****: indicates a variation on a command or environment.

Basic Typesetting

Basic Typesetting

- Simply enter your content in most times, just like using word or txt.
- When you need to start a new paragraph, add `\par` in the end or empty one line between two paragraphs.

```
1 The first paragraph. \par
2 The second paragraph.
3
4 The third paragraph.
```

The first paragraph.
The second paragraph.
The third paragraph.

Font effects

There are \LaTeX commands for a variety of font effects:

```

1 \textbf{hello world}
2
3 \textit{hello world}
4
5 \underline{hello world}
6
7 \textsc{hello world}
8
9 \textrm{hello world}

```

hello world

hello world

hello world

HELLO WORLD

hello world

Colored text

- Include the xcolor package in the preamble by `\usepackage{xcolor}`.
- Also can define customized color, such as `\definecolor{myred}{RGB}{231, 76, 60}`.

```
1 \textcolor{red}{Red}  
2 \textcolor{gray}{Gray}  
3 \textcolor{myred}{Myred}
```

Red Gray Myred

Font size

- The *global font size* can be set by the documentclass option.
- The *local font size* can be changed by the following commands.

```

1 {\tiny tiny}\\
2 {\scriptsize scriptsize}
  \\
3 {\footnotesize
  footnotesize}\\
4 {\small small}\\
5 {\normalsize normalsize}
  \\
6 {\large large}\\
7 {\Large Large}\\
8 {\LARGE LARGE}\\
9 {\huge huge}\\
10 {\Huge Huge}

```

tiny
 scriptsize
 footnotesize
 small
 normalsize
 large
 Large
 LARGE
 huge
 Huge

Lists

- L^AT_EX supports two types of lists: *enumerate* produces numbered lists, while *itemize* is for bulleted lists. Each list item is defined by `\item`. Lists can be nested to produce sub-lists.

```

1 \begin{enumerate}
2   \item First thing
3   \item Second thing
4   \begin{itemize}
5     \item A sub-thing
6     \item[-] Another sub-
       thing
7   \end{itemize}
8   \item[(3)] Third thing
9 \end{enumerate}

```

- ① First thing
- ② Second thing
 - A sub-thing
 - Another sub-thing
- (3) Third thing

Comments

- \LaTeX Comments are created using `%`. When \LaTeX encounters a `%` character while processing a `.tex` file, it ignores the rest of the line.

```
1 %comments 1
2 The following is comments
   2. % comments 2
```

The following is comments 2.

Special characters

1

```
\# \$ \% \^{} \& \_ \{ \}  
\~{} \textbackslash
```

\$ % ^ & _ { } ~ \

Equations

Mathematical modes

L^AT_EX allows two writing modes for mathematical expressions: the *inline mode* and the *display mode*. The first one is used to write formulas that are part of a text. The second one is used to write expressions that are not part of a text or paragraph, and are therefore put on separate lines.

- Inline mode: use `$equation$` or `\(equation\)`
- Display mode: use `$$equation$$` or `\[equation\]`

1 Inline mode: `$a=b+c$` or
 `\(a=b+c\)`

2
 3 Display mode:
 4 `\[a=b+c\]`
 5 `$$a=b+c$$`

Inline mode: $a = b + c$ or $a = b + c$

Display mode:

$$a = b + c$$

$$a = b + c$$

Equation Environment

- Another useful mode is the *equation environment*, which support the numbered equation and the reference.
- The reference can achieved through `\label{}` and `\ref{}`. The reference of the equation, table and figure are all the same.

```

1 An example
2 \begin{equation} \label{eq
   :myeq}
3 E=MC^2
4 \end{equation}
5 Equation \ref{eq:myeq} is
   mass-energy
   equivalence.

```

An example

$$E = MC^2 \quad (1)$$

Equation 1 is mass-energy equivalence.

Subscripts and Superscripts

Subscripts and superscripts are written using the symbols `_` and `^`.

```
1 \[ a_1^2=b_1^2+c_1^2 \]
2 \[ a_{mn}^2=b_{mn}^2 \]
3 \[ a_{\{mn\}}^2=b_{\{mn\}}^2 \]
```

$$a_1^2 = b_1^2 + c_1^2$$

$$a_m n^2 = b_m n^2$$

$$a_{mn}^2 = b_{mn}^2$$

Fractions

- To enable the fraction, you need to include the *amsmath* package, a powerful math package.
- `\frac{numerator}{denominator}`.

```

1 \[a_1 = \frac{b_1}{c_1}\]
2 \[a_1 = \frac{b_1}{c_1}mn\]
```

$$a_1 = \frac{b_1}{c_1}$$

$$a_1 = \frac{b_1}{c_1}mn$$

Brackets and Parentheses

- Use to `\left` and `\right` command to set dynamically resized brackets and parentheses.
- Even if you are using only one bracket, both commands are mandatory.

```

1 \[U_t=\left((1-\delta)
   \frac{A}{C}+\delta B
   \right)^{\frac{1}{1-
   \sigma}}\]
2 \[U_t=((1-\delta)\frac{A}{C}+\delta B)^{\frac{1}{1-
   \sigma}}\]
3 \[\left(A\right.\]

```

$$U_t = \left((1 - \delta) \frac{A}{C} + \delta B \right)^{\frac{1}{1 - \sigma}}$$

$$U_t = ((1 - \delta) \frac{A}{C} + \delta B)^{\frac{1}{1 - \sigma}}$$

(A

Aligning equations

- Amsmath package and `\begin{aligned}...\end{aligned}` environment.

```

1 \begin{equation}
2 \begin{aligned}
3 \frac{\partial U_t}{\partial A} &= (1 - \delta) U_t^{\frac{1}{1-\sigma}} A^{-\sigma} \\
4 \frac{\partial U_t}{\partial B} &= \delta U_t^{\frac{1}{1-\sigma}} B^{-\sigma}
5 \end{aligned}
6 \end{equation}

```

$$\begin{aligned}
 \frac{\partial U_t}{\partial A} &= (1 - \delta) U_t^{\frac{1}{1-\sigma}} A^{-\sigma} \\
 \frac{\partial U_t}{\partial B} &= \delta U_t^{\frac{1}{1-\sigma}} B^{-\sigma}
 \end{aligned}
 \tag{2}$$

Special symbols

- Integrals, sums and limits.
- Greek letters.
- math symbols.

```

1  \[\alpha\]
2  \[\beta\]
3  \[\int_{a}^{b} x^2 dx\]
4  \[\lim_{x \rightarrow \infty} f(x)\]
5  \[\uparrow \rightarrow \downarrow \leftarrow\]

```

 α β $\int_a^b x^2 dx$ $\lim_{x \rightarrow \infty} f(x)$ $\uparrow \rightarrow \downarrow \leftarrow$

Special symbols

Some trickier equations(not just math)

```

1 \begin{equation} \begin{aligned}
2 \oint \mathbf{B} \cdot d\mathbf{S} &= \mu_0 \epsilon_0 \frac{d\Phi_E}{dt} + \mu_0 i_{enc} \\
3 K_a &= \frac{[\mathrm{H}_3\mathrm{O}^+][\mathrm{A}^-]}{[\mathrm{HA}]} \\
4 V &= \left( \bigoplus_{\lambda \in \mathrm{Sec}(T)} V^{(\lambda)} \right) \oplus V

```

$$\oint \mathbf{B} \cdot d\mathbf{S} = \mu_0 \epsilon_0 \frac{d\Phi_E}{dt} + \mu_0 i_{enc}$$

$$K_a = \frac{[\mathrm{H}_3\mathrm{O}^+][\mathrm{A}^-]}{[\mathrm{HA}]} \quad (3)$$

$$V = \left(\bigoplus_{\lambda \in \mathrm{Sec}(T)} V^{(\lambda)} \right) \oplus V$$

Special symbols

Some supplementary material

- Latex mathematical symbols.pdf
- The great, big list of latex symbols.pdf

An online website

- <https://www.codecogs.com/latex/eqneditor.php?lang=zh-cn>

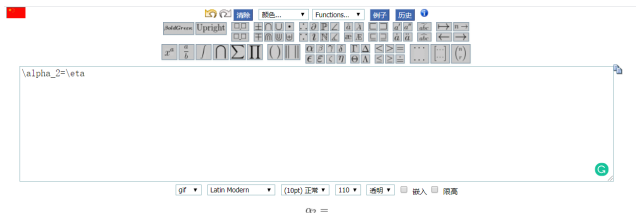


Figure 4: Online Equation Editor

Tables and Figures

Figures

- First include the *graphicx* package.
- Images should be EPS, PDF, PNG, JPEG or GIF files.

```

1 \begin{figure}[h]
2   \centering
3   \includegraphics[width
4     =0.7\linewidth]{ "
5     figs/new york"}
6   \caption{new york}
7   \label{fig:new-york}
8 \end{figure}

```



Figure 5: new york

Figures

- ① **[h]** is the placement specifier. put the figure approximately here.
 - Other options are **t**(at the top of the page), **b**(at the bottom of the page) and **p**(on a separate page for figures).
- ② `\centering` centres the image on the page, if not used images are left-aligned by default.
- ③ `\includegraphics{...}` is the command that actually puts the image in your document. The image file should be saved in the same folder as the .tex file.
- ④ `[width=0.7\textwidth]`. is an optional command that specifies the width of the picture in this case the same width as the text. The width could also be given in centimeters (cm).
- ⑤ `\label{...}` creates a label to allow you to refer to the table or figure in your text.

Figures

- ① **[h]** is the placement specifier. put the figure approximately here.
 - Other options are **t**(at the top of the page), **b**(at the bottom of the page) and **p**(on a separate page for figures).
- ② `\centering` centres the image on the page, if not used images are left-aligned by default.
- ③ `\label{...}` creates a label to allow you to refer to the table or figure in your text.

Tables

Tabular environment is used to typeset basic tables.

- ① The braces after `\begin{tabular}` defines the columns.
 - l for a column of left-aligned text.
 - r for a column of right-aligned text.
 - c for a column of center-aligned text.
 - | for a vertical line.

```

1  \begin{tabular}{|rc}
2    Apples & Green \\
3    \hline
4    Strawberries & Red \\
5    \cline{1-1}
6    Oranges & Orange \\
7  \end{tabular}

```

Apples	Green
Strawberries	Red
Oranges	Orange

Tables

Tabular environment is used to typeset basic tables.

- ① The table data follows the `\begin` command:
 - `&` is placed between columns.
 - `\\` is placed at the end of a row to start a new one.
 - `\hline` inserts a horizontal line.
 - `\cline{1-2}` a partial horizontal line between column 1 and column 2.

```

1  \begin{tabular}{|rc}
2    Apples & Green \\
3    \hline
4    Strawberries & Red
5      \\
6    \cline{1-1}
7    Oranges & Orange \\
    \end{tabular}

```

Apples	Green
Strawberries	Red
Oranges	Orange

Sample Tables

```

\begin{table}[]
\caption{Persistence of ***}
\begin{threeparttable}
\label{tab:persistence}
\centering
\scriptsize
\resizebox{\textwidth}{!}{%
\begin{tabular}{lcccc}
\hline
\multicolumn{1}{c}{n-year-ahead} & \multicolumn{1}{c}{Univariate Predictive} & \multicolumn{1}{c}{Controlling for} & \multicolumn{1}{c}{Controlling for} & \\
\multicolumn{1}{c}{\beta^{***}} & \multicolumn{1}{c}{Regressions} & \multicolumn{1}{c}{Lagged \beta^{MKT}} & \multicolumn{1}{c}{Lagged \beta^{MKT}} & \multicolumn{1}{c}{\beta^{SMB}} \\
and \beta^{HML} \\ \hline
n=1 & 0.7660*** & 0.7467*** & 0.7476*** & \\
& (24.66) & (25.14) & (25.96) & \\
n=2 & 0.5626*** & 0.5304*** & 0.5360*** & \\
& (15.26) & (14.56) & (15.43) & \\
n=3 & 0.3801*** & 0.3441*** & 0.3560*** & \\
& (10.50) & (9.49) & (10.20) & \\
n=4 & 0.2031*** & 0.1832*** & 0.1868*** & \\
& (5.65) & (5.46) & (5.91) & \\
n=5 & 0.0441 & 0.0487* & 0.0368 & \\
& (1.39) & (1.82) & (1.59) & \\
\hline
\end{tabular}%
}
\begin{flushleft}
This table tests the persistence of *** by running Fama and MacBeth Regression on n-year ahead  $\beta^{***}$  on current  $\beta^{***}$ . The first column reports the average slope coefficients on  $\beta^{GPR}$  from the univariate predictive regression. The second column reports the results after controlling  $\beta^{MKT}$ , and the third column reports the results after controlling  $\beta^{MKT}$ ,  $\beta^{SMB}$  and  $\beta^{HML}$ . Newey-West adjusted  $t$ -statistic are given in parentheses. ***, **, and * indicate the significance at the 10%, 5% and 1% levels, respectively. The sample period is January 1980-December 2018.
\end{flushleft}
\end{threeparttable}
\end{table}

```

Figure 6: Sample Table Code

Sample Table

Table 1: Persistence of ***

n-year-ahead β^{***}	Univariate Predictive Regressions	Controlling for Lagged β^{MKT}	Controlling for Lagged β^{MKT} , β^{SMB} and β^{HML}
n=1	0.7660*** (24.66)	0.7467*** (25.14)	0.7476*** (25.96)
n=2	0.5626*** (15.26)	0.5304*** (14.56)	0.5360*** (15.43)
n=3	0.3801*** (10.50)	0.3441*** (9.49)	0.3560*** (10.20)
n=4	0.2031*** (5.65)	0.1832*** (5.46)	0.1868*** (5.91)
n=5	0.0441 (1.39)	0.0487* (1.82)	0.0368 (1.59)

This table tests the persistence of *** by running Fama and MacBeth Regression on n-year ahead β^{***} on current β^{***} . The first column reports the average slope coefficients on β^{GPR} from the univariate predictive regression. The second column reports the results after controlling β^{MKT} , and the third column reports the results after controlling β^{MKT} , β^{SMB} and β^{HML} .

Newey-West adjusted t -statistic are given in parentheses. *, **, and *** indicate the significance at the 10%, 5% and 1% levels, respectively. The sample period is January 1980-December 2018.

Useful websites

Online \LaTeX table editor.

- 1 Tables Generator: <https://www.tablesgenerator.com/#>
- 2 L^AT_EX Complex Table Editor: <https://www.latex-tables.com/>
- 3 latex table editor: <https://truben.no/table/old/>

LaTeX Tables Generator

File • Edit • Table • Column • Row • Cell • Help •

Show an example table

	A	B	C
1	Item		
2	Animal	Description	Price (\$)
3	Gnat	per gram	13.65
4		each	0.01
5	Osu	stuffed	92.50
6	Eau	stuffed	33.33
7	Armadillo	frozen	8.99

Table caption

Enter table caption here

Label Use \ref{tab-my-table} to refer to your table in LaTeX

Figure 7: L^AT_EX Online Table Editor

Bibliography

How to cite literature in L^AT_EX

The BibTeX file is the key file.

- .bib file contains all the references you want to cite in your document.
- It should be kept in the same folder as your .tex file.
- It can be edited using Notepad or L^AT_EX editor.
- the bibtex reference can be downloaded from Google Scholar, Baidu Xueshu, or exported by EndNote, Mendeley, et.al.

```
@article{cochrane2011presidential,
  title={Presidential address: Discount rates},
  author={Cochrane, John H},
  journal={The Journal of finance},
  volume={66},
  number={4},
  pages={1047--1108},
  year={2011},
  publisher={Wiley Online Library}
}
```

Figure 8: BibTeX sample

How to cite literature in L^AT_EX

The .bst file is another file.

- .bst file is the reference style file.
- one can use .bst file to edit his customized reference style or use some journal-specific style.
- Include the name of the .bst file in the `\bibliographystyle{...}` command.

BibTeX Sample

- `\cite{jiang2019manager}` constructs a manager sentiment index based on the aggregated textual tone of corporate financial disclosures.
- `\bibliographystyle{jf}`
- `\bibliography{ref}`

Jiang, Lee, Martin, and Zhou (2019) constructs a manager sentiment index based on the aggregated textual tone of corporate financial disclosures.

Jiang, Fuwei, Joshua Lee, Xiumin Martin, and Guofu Zhou, 2019, Manager sentiment and stock returns, *Journal of Financial Economics* 132, 126–149.

Conclusion

Why \LaTeX ?

- \LaTeX allows you to concentrate on the content and the structure.
- \LaTeX has one of the most advanced math typesetting systems around.
- \LaTeX is incredibly extendible.
- \LaTeX keeps track of references so you don't have to.
- \LaTeX allows you to make more consistent, and more easily changeable, documents

Learning more

- The \LaTeX wikipedia: <https://en.wikibooks.org/wiki/LaTeX>
- The Not So Short Introduction to $\text{\LaTeX} 2_{\epsilon}$:
 - in English version and Chinese version.
 - with \LaTeX code.
- \LaTeX cheat sheets
 - LaTeX_24H_Note, Chang_LaTeX_sheet
- Some other books.

All the above materials can be downloaded from my GitHub repository.

Learning more

- Learn by examples or templates.
 - See overleaf.com
 - Most journals have their own \LaTeX template.
 - I upload template of AER, ECTA, RFS, 经济研究 to my GitHub.
- Google(Baidu) is your good friend.
 - Know what you want to do and Google it!
- Some useful websites:
 - TeX Live: <http://www.tug.org/texlive/>
 - TeXstudio: <https://www.texstudio.org/>
 - LaTeXstudio: <https://www.latexstudio.net/>

Thanks!