

# An Introduction to L<sup>A</sup>T<sub>E</sub>X

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## Abstract

This document is prepared for the L<sup>A</sup>T<sub>E</sub>X workshop at the University of Chicago. I briefly introduce how to install L<sup>A</sup>T<sub>E</sub>X on both Windows and Mac, and how to use the online L<sup>A</sup>T<sub>E</sub>X editor, the simple template, as well as the L<sup>A</sup>T<sub>E</sub>X template provided by the Dissertations Office. It is not intended to be a comprehensive guide for L<sup>A</sup>T<sub>E</sub>X, but rather a manual for people who might not be proficient with L<sup>A</sup>T<sub>E</sub>X. In addition, this manual is intended for attendants of the L<sup>A</sup>T<sub>E</sub>X workshop at the University of Chicago, so a lot of the details are not included in the text.

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\*Corresponding author. Please email me at [yuanya@uchicago.edu](mailto:yuanya@uchicago.edu). You may visit my webpage at <http://www.charles-yuan.com/>. I am grateful to Allison Kallo for making this workshop possible, and the Dissertation Office of the University of Chicago for allowing me to use the L<sup>A</sup>T<sub>E</sub>X dissertation template for instruction purposes. I also thank Corey Liss at IT Services and Colleen Mullarkey at the Dissertation Office for helpful comments. All errors contained within are my own.

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# 1 Installation

## 1.1 Windows

The best  $\text{\LaTeX}$  editing program on Windows, in my opinion, is  $\text{MiKTeX}$ . There is a complete project (<http://miktex.org/>) devoted to developing and maintaining  $\text{MiKTeX}$ . Essentially,  $\text{MiKTeX}$  is a typesetting system for the Windows operating system that consists of everything that you need to write a  $\text{\TeX}$  document.

To download, go to <http://miktex.org/download>, and download the Basic  $\text{MiKTeX}$  Installer. The basic version should be sufficient for most of your needs. You may simply run the  $\text{MiKTeX}$  installer and everything will be set up automatically. For further details about the installation, you may look up the  $\text{MiKTeX}$  manual at <http://docs.miktex.org/2.9/manual/ch02s02.html>.

If you encounter any problem with installation, you may schedule an appointment with me and we can go through the procedures together.

## 1.2 Mac

There are two ways to install  $\text{\LaTeX}$  on a Mac. I highly recommend the easy option. The only disadvantage of the easy option is that it requires downloading a 2.1GB file. However, since the internet connection on campus is fast, the download should take less than 30 minutes. To install, you may do the following:

1. Visit <http://www.tug.org/mactex/>, which provides the latest  $\text{MacTeX}$  distribution.
2. Download the  $\text{MacTeX.pkg}$  file. Admin rights may be required.
3. Once downloaded, double click it to install. If the link fails, follow the additional instructions on <http://www.tug.org/mactex/>. The package includes the program  $\text{\TeXShop}$ , which is designed for writing full documents in  $\text{\LaTeX}$  specifically on a Mac. Other editing programs may be downloaded separately.

If you'd like to go through the more difficult option, or if the above procedures fail, please schedule an appointment with me.

## 1.3 Online Editor

If you'd like to first try  $\text{\LaTeX}$  before going through the hassle of downloading and installing  $\text{\LaTeX}$  on your own computer, you have an option too! There is a great online  $\text{\LaTeX}$

editor that achieves many essential functionalities, called `writelATEX`. It is free and allows instantaneous preview of your document. You may wish to sign up an account so that you could save and restore your code. The url to the online editor is: <https://www.writelatex.com/>.

## 2 The Basics

### 2.1 A Simple Template

The structure of the `TEX` file that creates this manual is a very simple but powerful one. We will be using this as a simple template, before introducing the more advanced one provided by the Dissertation Office. The template is accessible through my website at <http://www.charles-yuan.com/teaching.html>. Please make sure to create a new folder for the `.tex` file, because `LATEX` will generate several new files when compiling. Please also make sure to download the other related files in order to ensure successful compilation.

I try to give as clear as possible explanations about each different components of the `.tex` file using comments. I will go through each component during workshop, too.

### 2.2 Mathematics

Some characters in mathematics: `#$%&_{}\`.

To embed mathematics within the text, we may place the mathematical expressions within the `$` signs. An example would be the following: *assume an investor has the exponential utility function  $u(c) = 1 - e^{-\alpha c}$ , where  $\alpha > 0$* <sup>1</sup>.

Sometimes you don't want to embed your mathematical expressions in the text. Instead you may wish to make your mathematical expressions a separate line. An example could be the following:

$$\mathcal{W} = \sum_{s=1}^2 \hat{\pi}_{s,T} \left( 1 - e^{-\alpha c_{s,T}^*(\hat{\pi}_{\mathbf{T}})} \right) + \sum_{s=1}^2 \pi_{s,T} \left( 1 - e^{-\alpha c_{s,T}^*(\hat{\pi}_{\mathbf{T}})} \right) \quad (1)$$

The above Equation (1) is very informative. Notice how to type in a calligraphic font ( $\mathcal{W}$ ), the summation sign ( $\sum$ ), subscripts and superscripts, big parentheses, and also how to insert a label and reference this line of expression later.

If you don't want to number an equation, simply put the `sign` within the `begin` and `end`

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<sup>1</sup>Most of the examples are taken from my own paper [Yuan, 2012]. Notice that this is also an example of how to insert footnotes in `LATEX`.

command as follows:

$$\mathcal{W} = \sum_{s=1}^2 \hat{\pi}_{s,T} \left( 1 - e^{-\alpha c_{s,T}^* (\hat{\pi}_T)} \right) + \sum_{s=1}^2 \pi_{s,T} \left( 1 - e^{-\alpha c_{s,T}^* (\hat{\pi}_T)} \right)$$

Sometimes you may want to type in fractions:

$$\frac{p_1}{p_1 + p_2 e^{-\alpha/p_1}}$$

Sometimes you may also want to create matrices:

$$\begin{bmatrix} -1 & 3 \\ 2 & -4 \end{bmatrix}$$

## 2.3 Greek Letters

The way to type in Greek and Hebrew letters is very intuitive. Simply type `\` followed by the name of the letter. For example:  $\alpha$ ,  $\beta$ ,  $\theta$ , etc.

A good reference for frequently used mathematical symbols could be found at <http://amath.colorado.edu/documentation/LaTeX/Symbols.pdf>.

## 2.4 Tables

To create a table in  $\LaTeX$ :

1	2	3
4	5	6
7	8	9

However, sometimes you may want to import tables into  $\LaTeX$  from another software, e.g., Stata. Linking tables from another software has one key advantage that if you make changes to, say a table in Stata, once you save the table in Stata the updates will be reflected in  $\LaTeX$  too. So you don't need to worry about making changes accordingly in  $\LaTeX$  as long as you link your tables from Stata properly. Everything is dynamic! This is especially beneficial when you work on a dissertation that could contain hundreds of tables.

Unfortunately, setting this feature up for Stata and  $\LaTeX$  takes sometime. For curious readers, Jörg Weber has a series of blog articles on how to integrate Stata generated tables into  $\LaTeX$ : <http://www.jwe.cc/2012/03/stata-latex-tables-estout/>. You may also consider setting up an appointment with me if you'd like to have this feature for your  $\LaTeX$ .

Or if you'd like to check if dynamic integration with  $\LaTeX$  is possible for other statistical software, you may email me as well.

## 2.5 Figures

For best visual effects, I highly recommend using vector or compound graphics (for more explanations, see [http://en.wikipedia.org/wiki/Vector\\_graphics](http://en.wikipedia.org/wiki/Vector_graphics)). Here I give an example:

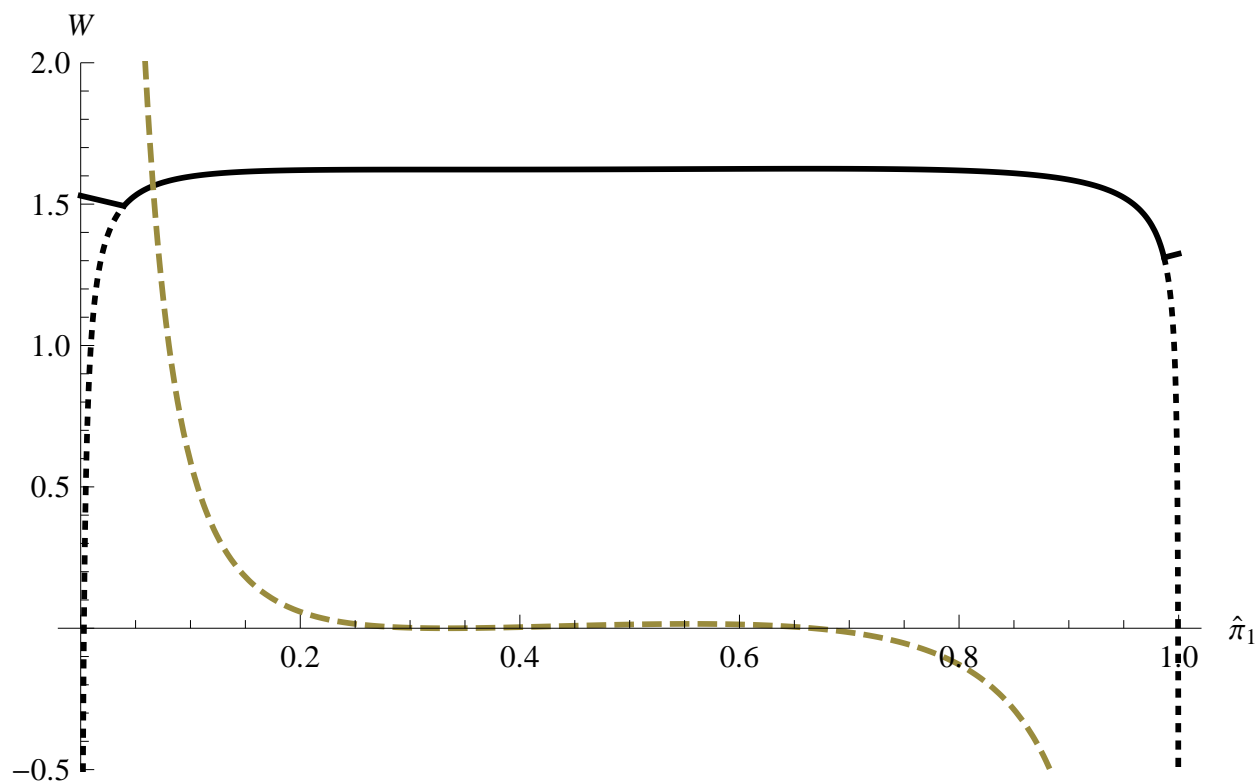


Figure 1: This is an example!

It is also possible to dynamically integrate figures generated by, say Stata, into  $\LaTeX$ . This is a more advanced topic and could be covered in another session or during an individual appointment.

## 2.6 Bibliography

I strongly recommend creating a `.bib` database to manage your references. Creating such a database could facilitate your citations because you need to type each reference only once and your citations could be outputted consistently. Take a look at the `samplerreference.bib`

file. How to cite a reference in-text? What about `bibliographystyle`? A good comparison of different bibliography styles is the following: <http://amath.colorado.edu/documentation/LaTeX/reference/faq/bibstyles.pdf>. If you don't want to create a `.bib` database, what to do?

## 3 Dissertation Template

### 3.1 Download

To download the University of Chicago's dissertation template, visit the page at <https://wiki.uchicago.edu/display/DissertationTemplate/LaTeX+dissertation+template>. Download the zip file by clicking the first link. Unzip the file and you will find the template in the folder.

A related template that is more suitable for big projects such as a dissertation was created by D. Kreisman in March 2012 for the Harris School of Public Policy. It is based on the template provided by the Dissertation Office. Please email me at [yuany@uchicago.edu](mailto:yuany@uchicago.edu) if you'd like to learn about and use that template instead.

### 3.2 A Quick Walk-Through

Although the dissertation template is fundamentally similar to this simple template, it is nevertheless more complicated. I will walk through the dissertation template quickly and point out some key components.

## 4 Slides and Posters

$\LaTeX$  is also a very good tool for creating professionally-looking slides and posters. These features could be covered in a more advanced  $\LaTeX$  workshop.

## References

Yuan, Y. (2012). Optimal beliefs in the long run: an overlapping generations perspective. *Economics Letters*, 17(2):525–527.