Introduction to LaTeX

M&S Talk Series

August 16th, 2016

AH Sheikh

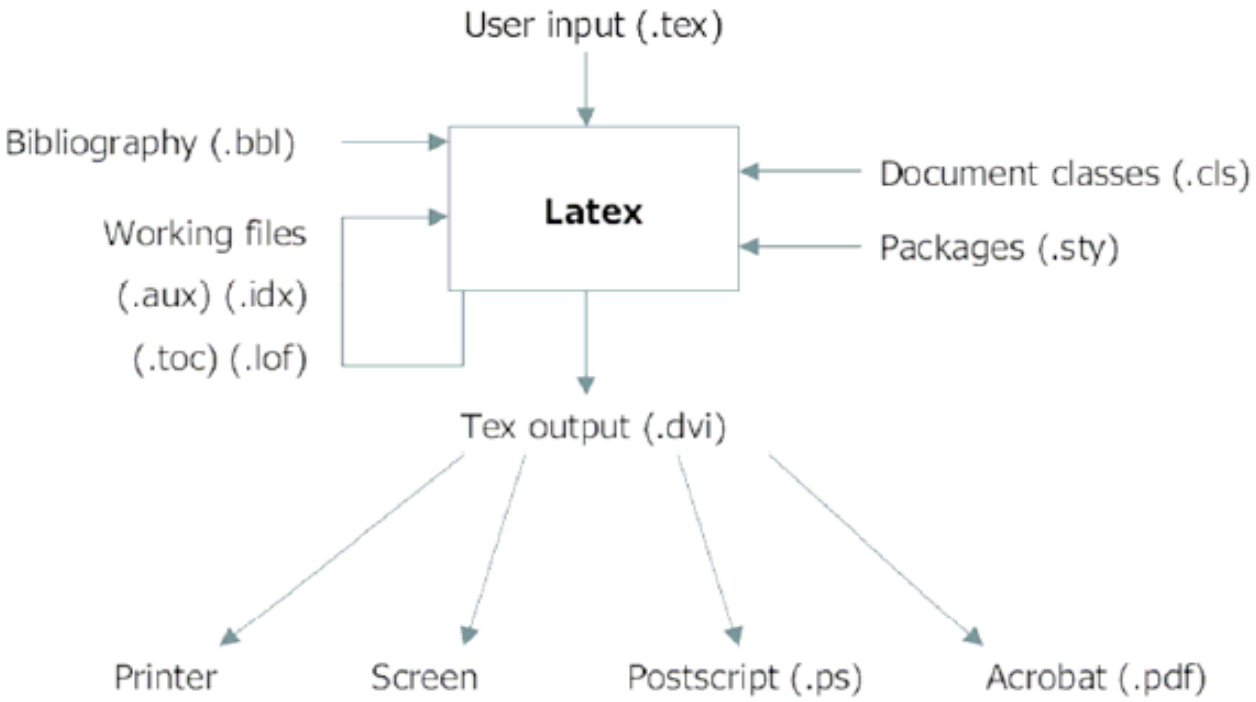
What is LaTeX?

- LaTeX is pronounced “lay-tech” or “lah-tech,” not “la-teks.”
- LaTeX is a document preparation system for high-quality typesetting.
- LaTeX is most often used to produce technical or scientific documents, but it can be used for almost any form of publishing.

Why Use LaTeX?

- Designed by academics and easily accommodates academic use.
- Professionally crafted predefined layouts make a document really look as if “printed.”
- Mathematical symbols and equations are easily integrated.
- Even complex structures such as footnotes, references, table of contents, and bibliographies can be generated easily.
- Forces author to focus on logical instead of aesthetic structure of a document.
- Creates more beautiful documents.
- Portable(Linux to Windows and vice versa)
- Ccompatible, flexible, versatile, and cheap (or free)!
- Stability and interchangeability (Office 97  Office 2000)

The Mechanisms of "TeXing"



Installing LaTeX

- In Windows
- MiKTeX
  - MiKTeX is a typesetting system for the Windows.
  - Download from www.miktex.org for free
  - It is generally recommended to install MiKTeX first, then WinEdt.
- WinEdt
  - WinEdt is a text editor.
  - WinEdt creates the source file (.tex and others).
  - Download from www.winedt.com for free for 30 days.
  - WinEdt costs $30.

Installing LaTeX

- Other text editors
  - There are other text editors.
  - Winshell for free (http://www.winshell.de/)
  - Scientific Workplace
    - Combination of LaTeX and Mathematics program
    - Does a good job of calculating and graphing, very user friendly, but expensive
- In Mac
- TexShop
  - Download for free http://www.uoregon.edu/~koch/texshop/
  - Includes everything!

DIY

Writing My First LaTeXArticle

Byungwon Woo

June 8, 2009

Abstract

My first article written in LaTeX(or LaTeX) using WinEdt.

1 Introduction

Both ARMA and ARIMA model specifications and technologies have been useful to political scientists.

Economists argue that certain processes "inherit" their fractional integration properties from the exogenous forces that affect them.[1] Such a theory, which begs the question of wy the exogenous variables are themselves fractionally integrated, is used in the literature on multivariate models for fractional cointegration in which certain time series are predicted to move together over time (Cheung & Lai 1993).

2 Fractional Integration

To model such long-range persistence, analysts can use an ARFIMA model in which the fractionally integrated time series is represented as:

$$\phi(L)(1-L)^d x_t = \theta(L)\epsilon_t$$

2.1 Diagnostic Tests

Although they cannot precisely pinpoint the degree of integration in a time series, we begin our analysis with a brief look at the conclusions we reached on the basis of diagnostic tests of the macropartisanship, consumer sentiment, and presidential approval[2] series.

Table 1: Summary of Conclusions from Diagnostic Tests

	Macropartisanship	Consumer Sentiment	Presidential Approval
Joint F test	$d = 1$	$d = 1$	$d = 0$
VR test	$0 < d \leq 1$	$d = 1$	$0 < d \leq 1$

[1] If you do not understand the text of this example, that is totally OK.

[2] Because of the controversy surrounding the properties of presidential approval(Ostrom & Smith 1993, Beck 1993), we emphasize the properties of the untransformed series.

References

Beck, Nathaniel. 1993. "The Methodology of Cointegration." *Political Analysis* 4:237–48.

Cheung, Yin-Wong & Kon S. Lai. 1993. "A Fractional Cointegration Analysis of Purchasing Power Parity." *Journal of Business and Economic Statistics* 11:103–12.

Ostrom, Charles W., Kr. & Renee M. Smith. 1993. "Error Correction, Attitude Persistence, and Executive Rewards and Punishments: A Behavioral Theory of Presidential Approval." *Political Analysis* 4:127–84.

Basic Document Structure

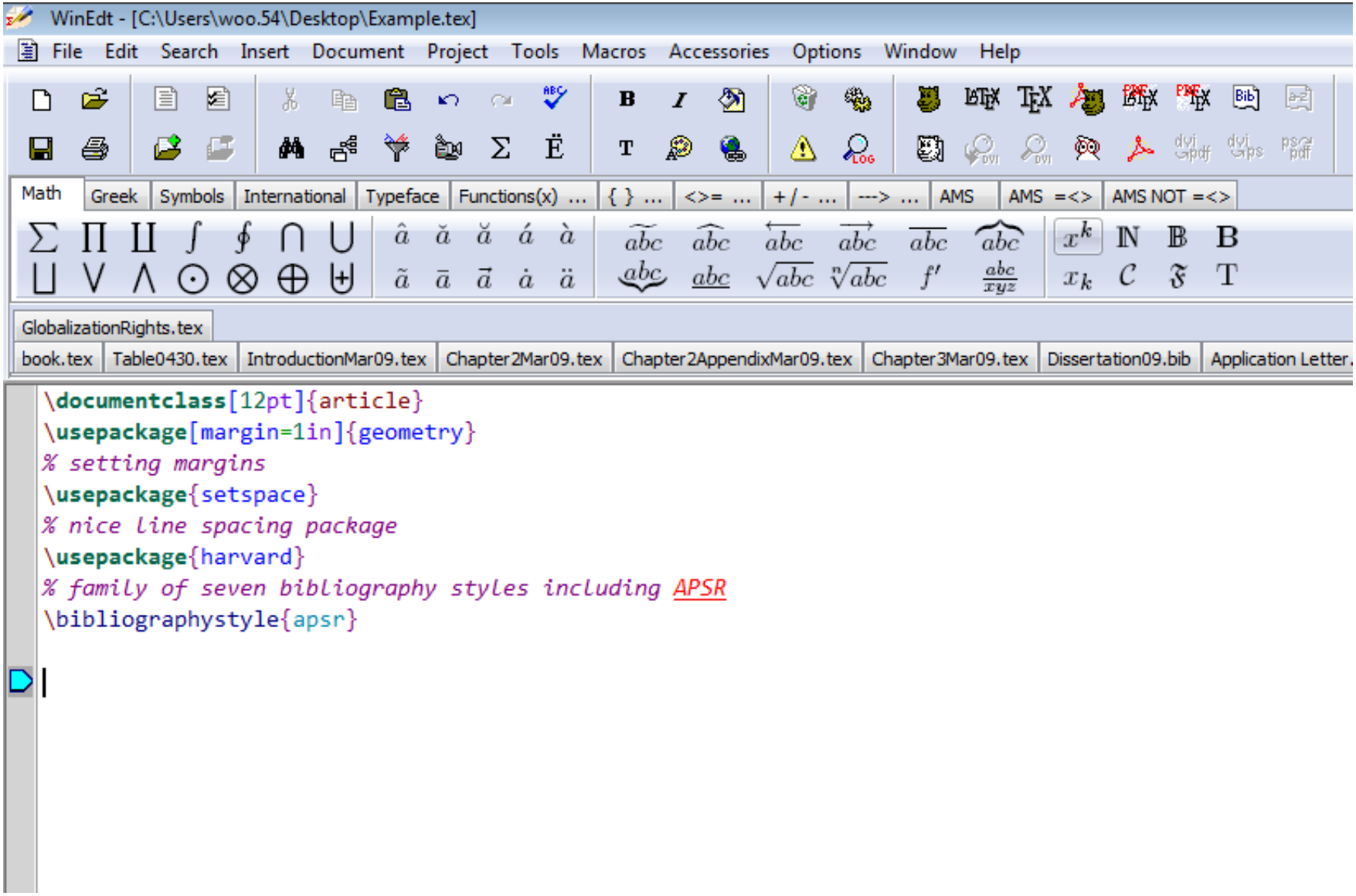
- The format of a document is pretty simple.
  - In the preamble
    - Documentclass
    - Packages
  - In the front matter
    - Title/author
  - In the body
    - Contents
  - In the back matter
    - bibliography

Our First Document

- Create sample file `example1.tex` in your favorite editor
- Note the basic parts:
  - `\documentclass` declaration {Preamble
  - `\begin{document}` } Front
  - `\author`, `\title`, and `\maketitle` } Matter
  - Document contents {Body
  - `\end{document}` {Back Matter
- Run `pdflatex example1`
- Read `example1.pdf`

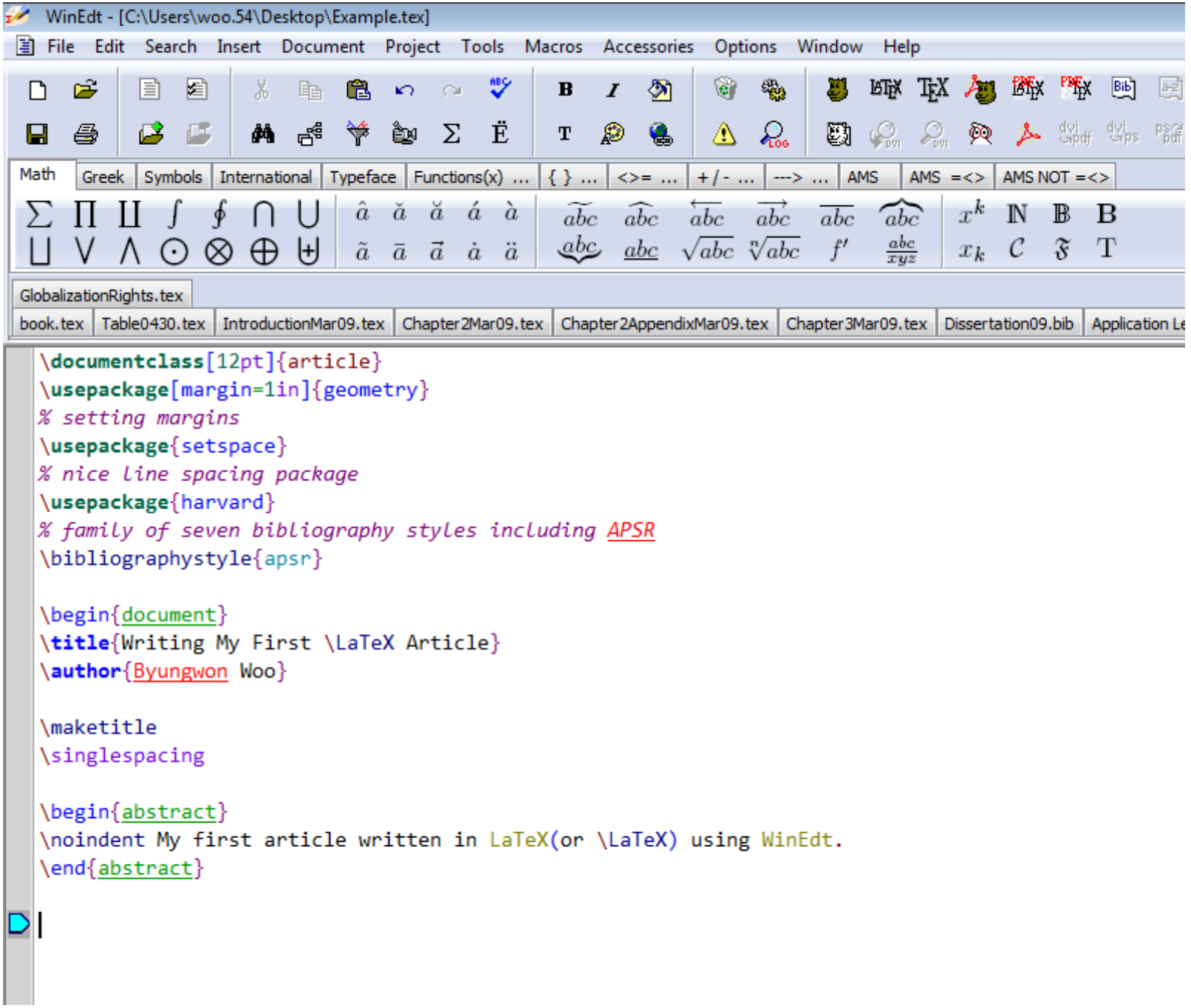
In the Preamble

- You specify your document class.
  - Document classes: letter, article, report, book, slides(beamer, prosper)
    - \documentclass[12pt]{article}
    - Backslash – at the beginning of text markup command
  - Packages: numerous packages are available
    - \usepackage[margin=1in]{geometry}
    - \usepackage{setspace}
    - \usepackage{harvard}


WinEdt - [C:\Users\woo.54\Desktop\Example.tex]
File Edit Search Insert Document Project Tools Macros Accessories Options Window Help
Math Greek Symbols International Typeface Functions(x) ... { } ... <>= ... +/- ... ---> ... AMS AMS =<> AMS NOT =<>
GlobalizationRights.tex
book.tex Table0430.tex IntroductionMar09.tex Chapter2Mar09.tex Chapter2AppendixMar09.tex Chapter3Mar09.tex Dissertation09.bib Application Letter.
\documentclass[12pt]{article}
\usepackage[margin=1in]{geometry}
% setting margins
\usepackage{setspace}
% nice line spacing package
\usepackage{harvard}
% family of seven bibliography styles including APSR
\bibliographystyle{apsr}

In the Front Matter

- \begin{document}
- \title{}
- \author{}
- \maketitle
- \begin{abstract}
- \end{abstract}
- \pagebreak
- Etecetra…


WinEdt - [C:\Users\woo.54\Desktop\Example.tex]
File Edit Search Insert Document Project Tools Macros Accessories Options Window Help
Math Greek Symbols International Typeface Functions(x) ... { } ... <>= ... +/- ... ---> ... AMS AMS =<> AMS NOT =<>
GlobalizationRights.tex
book.tex Table0430.tex IntroductionMar09.tex Chapter2Mar09.tex Chapter2AppendixMar09.tex Chapter3Mar09.tex Dissertation09.bib Application Le
\documentclass[12pt]{article}
\usepackage[margin=1in]{geometry}
% setting margins
\usepackage{setspace}
% nice line spacing package
\usepackage{harvard}
% family of seven bibliography styles including APSR
\bibliographystyle{apsr}
\begin{document}
\title{Writing My First \LaTeX Article}
\author{Byungwon Woo}
\maketitle
\singlespacing
\begin{abstract}
\noindent My first article written in LaTeX(or \LaTeX) using WinEdt.
\end{abstract}

In the Body

- To begin a new section
- \section{}
  - Similarly, \subsection{}, \subsubsection{}, \subsubsubsection{}
  - LaTeX does automatic numbering. If you don't like it, use section*{}
- \emph{}, \textbf{}
- \singlespacing, \doublespacing, \onehalfspacing
- \centering or \begin{centering} & \end{centering}

Footnotes/Quotes/Equations

- \footnote{}
- \begin{quote} & \end{quote}
- ` ’, `` ’’ for quatations
- Mathematical Equations
  - Math always in between $ & $
    - Alternatively, \begin{equation} & \end{equation}
  - $ 1+4=5 $
  - \frac{}{}, \sqrt{}, \sum_{k=1}^{n}
  - ^{}, _{}
  - \greek letters (e.g. \alpha or \Alpha)
  - WinEdt also provides click and type functions.

Sectioning Commands

- `\part{}`
- `\chapter{}`
- `\section{}`
- `\subsection{}`
- `\subsubsection{}`
- `\paragraph{}`
- `\subparagraph{}`

- Each of the above has an unnumbered "starred" form (i.e. `\section*{}`)

Labels and References

- At almost any point in the document you can place a "label" using `\label{key}`, where the argument is a "key", a short one word description of the location.
- You can refer to this label by section and page number using `\ref{key}` and `\pageref{key}`, respectively.
- Advanced: you can use `\autoref{key}` to automatically place the proper label (i.e. Section 2.1 or Table 1.1 instead of just 2.1 or 1.1). Must include the `hyperref` package.

Sectioning-Example

- % This is an example.tex
- \documentclass [12pt]{article}

- \begin {document}
- \section {Introduction}
- \label {intro}

- This is section on Introduction.

- \subsection {experiment}
- \label {exp}

- This is an example subsection.
- Please refer Section.\ref {intro} for
- introduction. Refer Section \ref {exp}

- \end {document}

1 Introduction

This is section on Introduction.

1.1 experiment

This is an example subsection. Please refer Section.1 for introduction. Refer Section. 1.1

Reference-examples

- % This is an example.tex
- \documentclass [12pt]{article}
- \bibliographystyle {IEEEtran}
- \begin {document}
- \section {Introduction}
- \label {intro}

- This is section on Introduction.

- \subsection {experiment}
- \label {exp}

- This is an example subsection. This
- work is based on the
- MP algorithm \cite {mallat2}

- \bibliography {bibfile}
- \end {document}

1 Introduction

This is section on Introduction.

1.1 experiment

This is an example subsection. This work is based on the MP algorithm [1]

References

[1] S. G. Mallat and Z. Zhang, "Matching pursuit with time-frequency dictionaries," *IEEE Trans. Signal Processing*, vol. 41, no. 12, pp. 3397–3415, 1993.

Sizes

\tiny \scriptsize \footnotesize \small

\normalsize \large \Large

\LARGE \huge \Huge

- Note these are declarations, so the proper syntax is {\Large Text}

Environments

- For special purpose text such as lists, quotations, poetry verse, and aligned text, LATEX provides *environments*.
- To use an environment, you use `\begin{}` and `\end{}`:

```
\begin{environment}
\end{environment}
```

- where `environment` is the name of the particular environment.

Lists

- Two of the simplest environments are list environments. The first is the `itemize` environment. Each item starts with `\item`:

```
\begin{itemize}
\item First item.
\item Another item.
\item Yet another item.
\end{itemize}
```

- The `enumerate` environment does the same thing, but numbers the entries.

Alignment Environments

- The next simplest environments are the alignment environments `center`, `flushleft`, and `flushright`, which align the text accordingly. For example, the `center` environment centers the text:

```
\begin{center}
   Centered Text
\end{center}
```

Centered Text

Math

- LATEX provides two basic methods of typesetting math, “inline” which occursinside of a sentence: $a = b + c$, and “displayed”, which occurs centered between paragraphs:

$$a = b + c$$

- To typeset material in inline mode, surround it with dollar signs: $ . . . $. Thus,
- $A=bh$ yields $A = bh$.

Displayed Equations

- To type displayed math, use `\[` and `\]` instead. So `\[A=bh\]` yields

$$A = bh$$

- If instead you use the `equation` environment instead of `\[` and `\]`, you get the same results, but with an equation number:

$$A = bh \tag{1}$$

- Note that if you put a `\label` in here, you can refer to that equation number elsewhere in the text.

Differences from Text Mode

- Spaces in math mode are ignored.
- No empty lines are allowed.
- Letters are italicizes
- All letters are typed as single variables, not words. So `$effective$` (*effective*) typsets much differently from "*effective*"

Basic Math Building Blocks

- **Sub/superscripts** are produced with _ and ^. For example, `$p_2$` gives p_2 and
- `$x^y$` gives x^y. Note these only work on a single character - to sub – or superscript an expression surround it with curly braces.
- **Fractions** are produced using `\frac`, which takes two arguments, one for the
- numerator and one for the denominator. `$\frac{5}{8}$` yields $\frac{5}{8}$.

More Basic Math

- **Radicals** are produced using `\sqrt`, with `$\sqrt{x}$` yielding the square root of *x* and `$\sqrt[3]{2}$` yielding the cube root of 2
- **Lowercase Greek Letters** are given by simply spelling out the letter as a macro, `$\delta$` yielding δ, etc.
- **Uppercase Greek letters** are the same, except the macro name is capitalized,
- Ω yielding Ω, etc.

Math Exercises

- How would you typeset:

1. $y = \sqrt[z]{x^2 + w_2^2}$
2. $\sigma = \frac{\Omega^x + y_2}{\sqrt{x}}$
3. $\sqrt[n+1]{a}$
4. τ_{xy}''

1. $y=\sqrt[z]{x^2+w_2^2}$
2. $\sigma=\frac{\Omega^{x}+y_2}{\sqrt{x}}$
3. $\sqrt[n+1]{a}$
4. τ_{xy}''

Spacing

- Sometimes you may wish to “tweak” the spacing in math mode. The followingmacros are provided for this purpose:

  `\,` thin space

  `\:` medium space

  `\!` negative thin space

  `\;` thick space

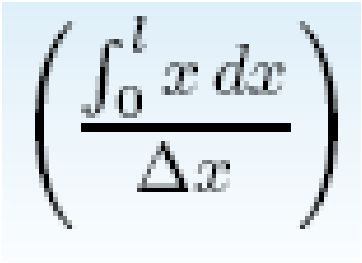
OR simply putting letters ~ creates space in mathmode

Integrals and Summations

- To do integrals and summations, simply put in a `\int`. For example, `\[\int x\,dx\]` (note the spacing factor)
- To add limits, simply sub and superscript the integral, `\[\int_0^\infty x\,dx\]`,
- To do summations, simply do the same thing with \sum.

Parentheses, Braces, etc.

- To use parentheses and braces, simple type the character for them. For curly braces, you have to type `\{` and `\}` since `{` and `}` are reserved for defining groups.
- However, if you want to type large expressions containing symbols such as integrals and fractions, it is nice to have larger versions of these delimiters. If you preface the delimiters with `\left` and `\right`, you get larger symbols that are (usually) the right size.
- Example: `\[\left(\frac{\int_0^l x\,dx}{\Delta x}\right)\]` gives



More Math Exercises

- Typeset the following:

1. $1 + \left(\frac{1}{1-x^2}\right)^3$
2. $\pi(n) = \sum_{k=2}^{n} \left[\frac{\phi(k)}{k-1}\right]$
3. $\Delta x = x_{\max} - x_{\min}$
4. $A = \int_0^{\pi} r^2 \, dr$

Answers to More Examples

1. `$1+\left(\frac{1}{1-x^2}\right)^3$`
2. `$\pi(n)=\sum_{k=2}^{n}\left[\frac{\phi(k)}{k-1}\right]$`
3. `$\Delta x=x_{\mathrm{max}}-x_{\mathrm{min}}$`
4. `$A=\int_0^\pi r^2\,dr$`

Graphics

- % This is an example.tex

- \documentclass [12pt]{article}
- \usepackage {epsfig, graphicx}
- \begin {document}

- \begin {figure}
- \epsfxsize =4.5in
- \centerline {\epsffile{platypus.eps}}
- \caption {Sample Figure.}
- \label {fig1}
- \end {figure}

- \end {document}

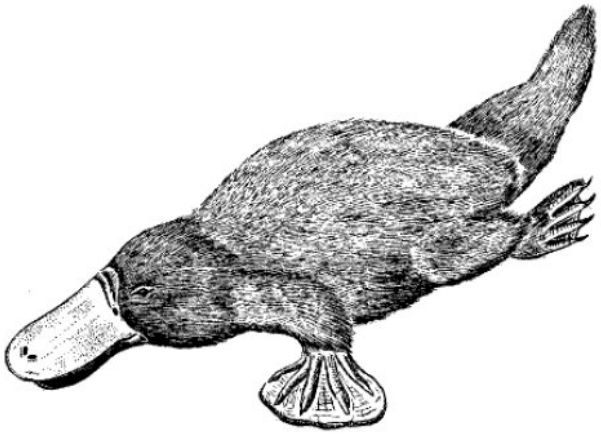


Figure 1: Sample Figure.

Commenting…

- You have privilege to write some thing in source file (.tex file) and not to print it in pdf file. This is called commenting.
- That is quite simple: put % sign before any word, line or paragraph. It will not execute and print that word, line or paragraph. Example

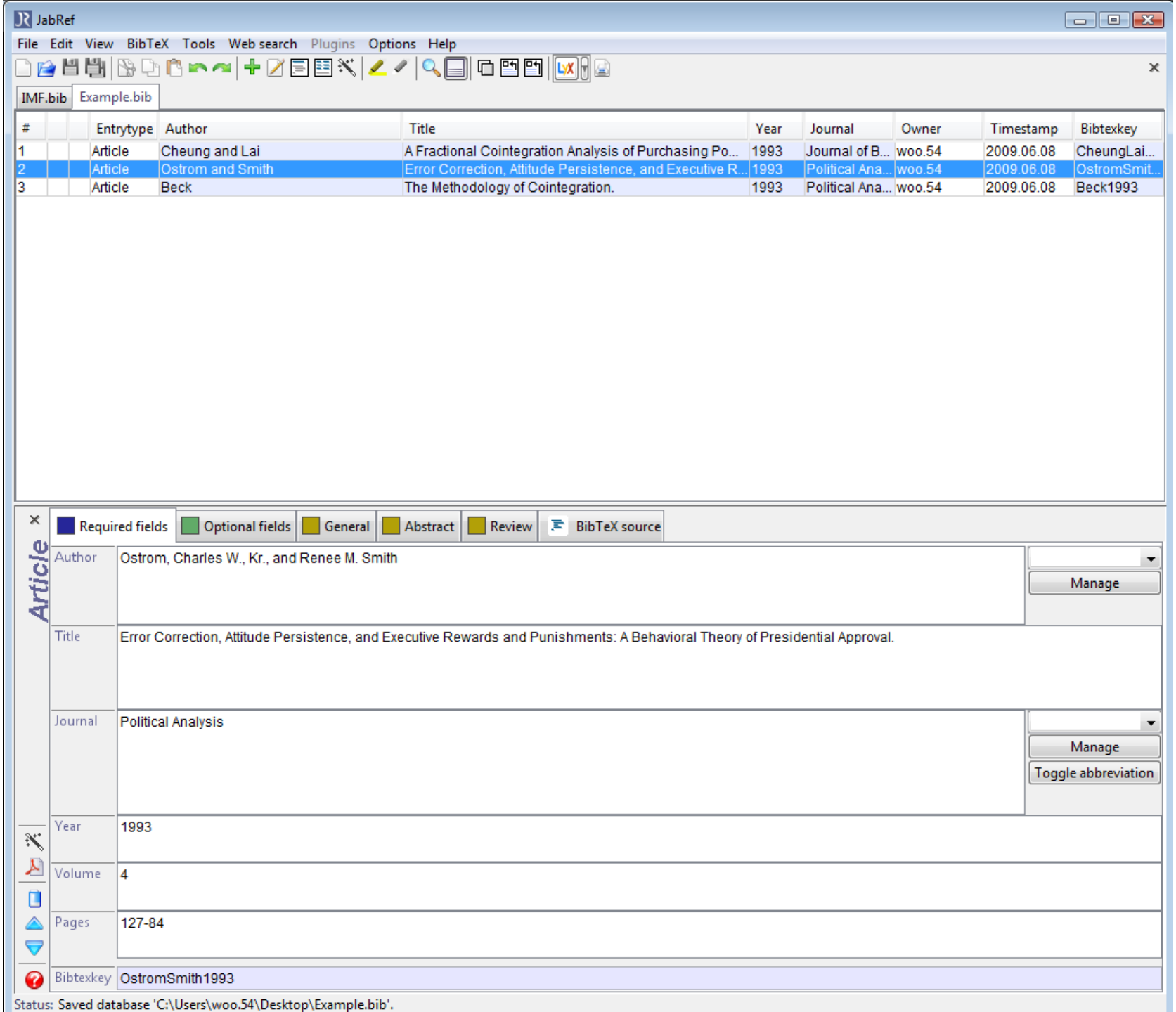
%Please print this line.

Common Mistakes

- Sometimes LATEX will give you errors when you try to run it because of problems with your input le. As mentioned earlier, sometimes the location of the error that LATEX reports may not be correct, so it is useful to know what usually causes these problems. Usual sources of error include:
  - Misspelled command or environment names
  - Missing or improperly nested \end statements.
  - Improperly matched { and }. They should always come in pairs.
  - Missing command arguments.
  - A missing $.
  - Using one of the special LATEX characters such as #.

Citations

- \cite{bibtexkey}, citeyear{bibtexkey}
- It is more convenient to create a bibliography file, called bibtex file(.bib) and use it as needed.
- WinEdt is capable of creating a bib file, but there are more convenient tools out there.
- JabRef (http://jabref.sourceforge.net/)


JabRef
File Edit View BibTeX Tools Web search Plugins Options Help
IMF.bib Example.bib
Entrytype Author Title Year Journal Owner Timestamp Bibtexkey
1 Article Cheung and Lai A Fractional Cointegration Analysis of Purchasing Po... 1993 Journal of B... woo.54 2009.06.08 CheungLai...
2 Article Ostrom and Smith Error Correction, Attitude Persistence, and Executive R... 1993 Political Ana... woo.54 2009.06.08 OstromSmit...
3 Article Beck The Methodology of Cointegration. 1993 Political Ana... woo.54 2009.06.08 Beck1993
Article
Required fields Optional fields General Abstract Review BibTeX source
Author Ostrom, Charles W., Kr., and Renee M. Smith
Manage
Title Error Correction, Attitude Persistence, and Executive Rewards and Punishments: A Behavioral Theory of Presidential Approval.
Journal Political Analysis
Manage
Toggle abbreviation
Year 1993
Volume 4
Pages 127-84
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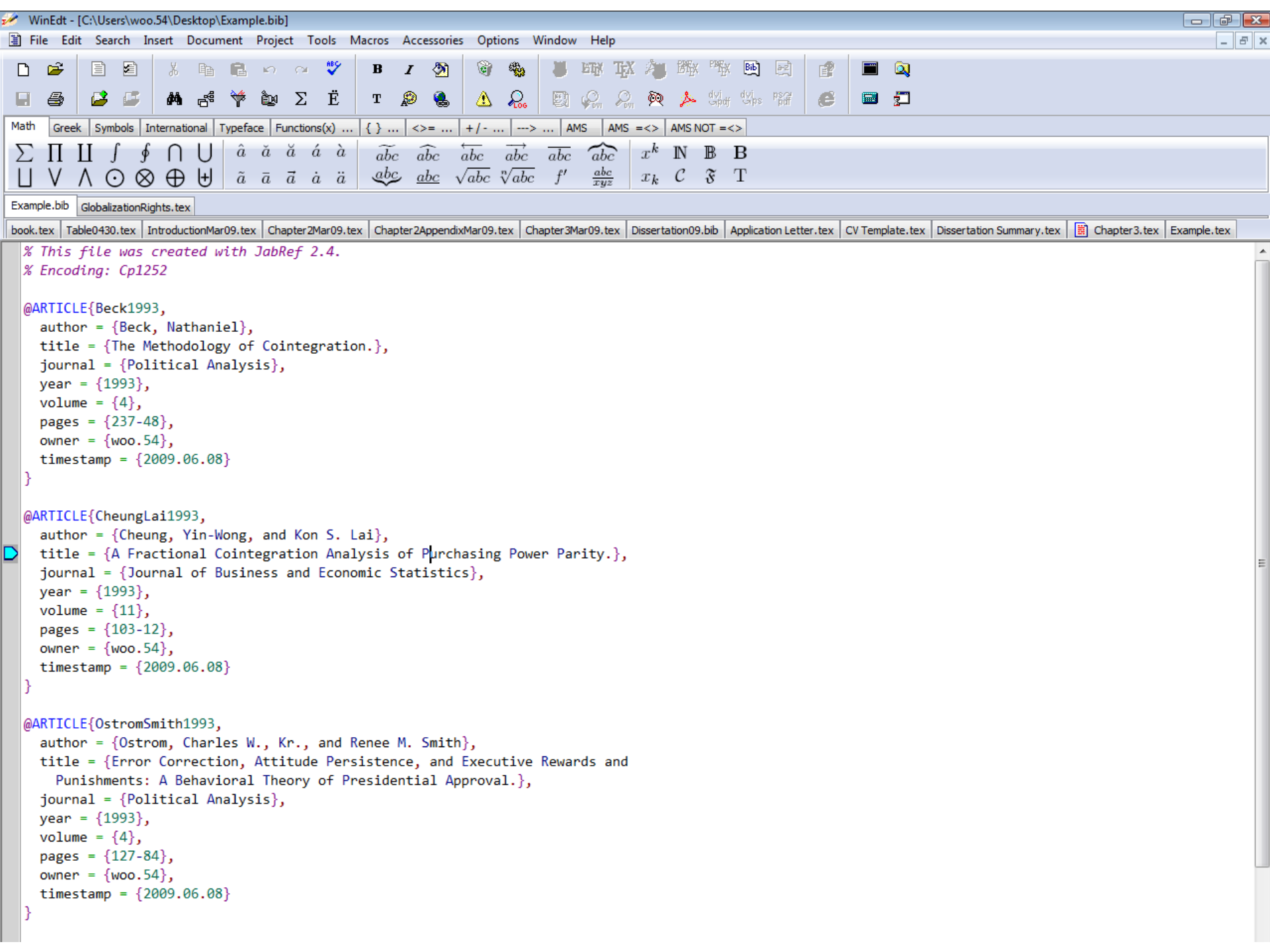
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Math Greek Symbols International Typeface Functions(x) ... { } ... <>= ... +/- ... ---> ... AMS AMS =<> AMS NOT =<>
Example.bib GlobalizationRights.tex
book.tex Table0430.tex IntroductionMar09.tex Chapter2Mar09.tex Chapter2AppendixMar09.tex Chapter3Mar09.tex Dissertation09.bib Application Letter.tex CV Template.tex Dissertation Summary.tex Chapter3.tex Example.tex
% This file was created with JabRef 2.4.
% Encoding: Cp1252
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title = {A Fractional Cointegration Analysis of Purchasing Power Parity.},
journal = {Journal of Business and Economic Statistics},
year = {1993},
volume = {11},
pages = {103-12},
owner = {woo.54},
timestamp = {2009.06.08}
}
@ARTICLE{OstromSmith1993,
author = {Ostrom, Charles W., Kr., and Renee M. Smith},
title = {Error Correction, Attitude Persistence, and Executive Rewards and
Punishments: A Behavioral Theory of Presidential Approval.},
journal = {Political Analysis},
year = {1993},
volume = {4},
pages = {127-84},
owner = {woo.54},
timestamp = {2009.06.08}
}

```
\documentclass[12pt]{article}
\usepackage[margin=1in]{geometry}
% setting margins
\usepackage{setspace}
% nice line spacing package
\usepackage{harvard}
% family of seven bibliography styles including APSR
\bibliographystyle{apsr}

\begin{document}
\title{Writing My First \LaTeX Article}
\author{Byungwon Woo}

\maketitle
\singlespacing

\begin{abstract}
\noindent My first article written in LaTeX(or \LaTeX) using WinEdt.
\end{abstract}

\newpage
\doublespacing

\section{Introduction}
Both ARMA and ARIMA model specifications and technologies have been useful to political scientists.

Economists argue that certain processes ``inherit'' their fractional integration properties from the exogenous forces that affect them.\footnote{If you do not understand the text of this example, that is totally OK.} Such a theory, which begs the question of wy the exogenous variables are themselves fractionally integrated, is used in the literature on multivariate models for fractional cointegration in which certain time series are predicted to move together over time \cite{CheungLai1993}.

\section{Fractional Integration}
To model such long-range persistence, analysts can use an ARFIMA model in which the fractionally integrated time series is represented as:\\
%\[
%\phi(L)(1-L)^{d}x_{t}=\theta(L)\epsilon_{t}
%\]

$\phi(L)(1-L)^{d}x_{t}=\theta(L)\epsilon_{t}$
```

Creating a Table

- Add numbered table
  - \begin{table} \caption{}
- Creating a table
- Simple tables can be produced by
  - \begin{tabular}[pos]{tablespec}
  - Within the {tablespec} section, one details the number of columns, the alignment, and the number of vertical lines of the table.
    - {lrc}, {|l|r|c}
  - Then type in from left to right, the values for each cell with & in between.
  - Put "\\" at the end of each row, then input another row of values if needed.
  - \hline
  - For STATA users, after downloading the "outtex" package online, one can simply type "outtex" after any estimation and STATA will spit out LaTeX code for the results table presented.

Table-example

```
% This is an example.tex

\documentclass [12pt]{article}
\usepackage {epsfig, graphicx}
\begin {documen}

\begin {table}
        \centering
        \begin {tabular}{|c|c|c|c|c|} \hline
Method &Groups  & Normal & Abnormal & Total \\ \hline

        LR  & Normal & 40 & 11 & 51\\
            & Abnormal & 17 & 22 & 39 \\\hline
      \%    & Normal & \bf{78.4} & 21.6 & 100 \\
            & Abnormal & 43.6 & \bf {56.4} & 100 \\\hline
              \end {tabular}
        \caption {Sample Table}
        \label {tab1}
\end {table}
\end {document}
```

Method	Groups	Normal	Abnormal	Total
LR	Normal	40	11	51
	Abnormal	17	22	39
%	Normal	**78.4**	21.6	100
	Abnormal	43.6	**56.4**	100

Table 1: Sample Table

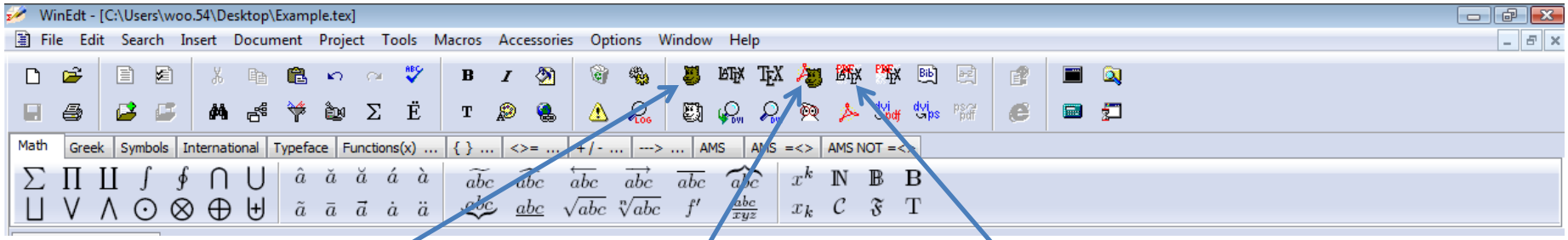
Online Table Generator

- http://www.tablesgenerator.com/

In the Back Matter

- Don’t forget bibliography{filename}
  - Make sure that the bibtex file is saved in the same location where the main tex file is saved.
- Don’t forget end{document}

Seeing the Document



Press on the smiling bear to convert to .dvi

Press on the PDF+happy bear to convert to .pdf and open it

Press on the PDF/LaTeX to convert to .pdf

Other Resources

- Books
  - Leslie Lampert. 1994. LaTeX: A Document Preparation System.
  - Helmut Kopta and Patrick W. Daly. 2004.Guide to LaTex
  - Frank Mittelbach et al. 2004. The LaTeX Companion
- Online Guides
  - http://en.wikibooks.org/wiki/LaTeX
  - http://tobi.oetiker.ch/lshort/lshort.pdf
  - CV and dissertation templates are available on line