Using LATEX in reports at Grattan

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Interpreting code examples

or inline: \TeX{}.

Example code are written using a listing:

```
LaTeX code with some \markup.
\begin{environment}
\end{environment}
```

Code examples can be, for want of better terms, *complete* or *illustrative*. **Complete** code means the code should be copied-and-pasted directly into the input file without modification, whereas illustrative code should be modified based on the desired output. For example, if an author wishes to increase the gap between

columns in the overview by 2 mm, the code excerpt is complete. The author should copy and paste the following, placing it before \begin{overview}:

```
\newlength{\overviewextra}
\setlength{\overviewextra}{2mm}
\addtolength{\columnsep}{\overviewextra}
```

Whereas an illustrative version of the following, where the author is offered a choice for the gap between columns, the option is coloured violet, slanted, and delimited with chevrons:

```
\newlength{\overviewextra}
\setlength{\overviewextra}{<extra column width>}
\addtolength{\columnsep}{\overviewextra}
```

Coloured text is simply syntax highlighting and has no special meaning. All TEX documents are written in plain text (although your text editor/IDE may offer or display similar syntax highlighting).

1 Some principles for erstwhile MS Word users

Learning LETEX as an MS Word user is a frustrating, confusing, rewarding, and ecstatic experience. There are some principles that are inviolate for novices.

- I. Don't worry about the appearance of your document as your write. Write what you mean. MS Word is a What You See Is What You Get editor. LATEX is a What You See Is What You Mean.
- 2. LATEX takes an author's input and sets out the document's appearance using the author's raw input, the author's advice about how the document should look, and a set of parameters and algorithms that govern tradeoffs concerning document appearance.
- 3. The grattan.cls template is designed so that authors do not have to make any layout or typographic decisions.
- 4. Let X is a butler, not a robot. It may not do exactly as you say, but it will do what you mean. When it doesn't, it either means
 - · You given it a nonsensical instruction
 - Your instruction contradicts another instruction
 - Your instruction contravenes good typographic design, as it sees fit
- 5. LATEX is a butler, not a slave: it is a partner in document preparation. In general, your responsibilities should not overlap: you decide the content and it decides the form. Where your responsibilities do overlap, you should seek to advise LATEX, not to order it. Further, you should be as gentle as possible with your advice. Only forcefully advise when the document will not require amendments and you are sure LATEX is wrong.
- 6. Don't manually position figures, tables, or boxes. Let them float in the document. It is nearly certain that the initial placement will be odd. As long you have used a figure, table or *box environment, they will float into good positions. For errant figures, tables, or boxes, wait until the document is completely finished before advising positions.
- 7. Don't do any of the following:
 - a) Insert horizontal or vertical whitespace, including manual line-breaks (except in tables)
 - b) page- or column-breaking
- 8. Do not ignore errors (*i.e.* things that prevent compilation). Any errors which you can't resolve in less than 60 seconds should be referred to Cameron Chisholm or Hugh Parsonage. Preferably attach what you think caused the error.

- 9. Take note of warnings from time to time. Warnings relating to bibliographies should be fixed immediately. Other warnings are typically just hints that manual intervention may improve the layout resolving them can be deferred.
- 10. Beware special characters.

When you want this	type this.
\$	\\$
%	\%
"	`` (button above Tab)
"	1.1
– (en-dash)	
— (em-dash)	

- II. The grattan class file assumes your input is encoded in utf8. Avoid copying from MS Word to .tex files. Otherwise, special characters above will creep in silently. If you must, use pandoc.
- 12. Use % for comments.

2 Basics of LATEX

2.1 Compilation

The process of LATEX is basically:

- 1. Start with a plain text file with the file extension .tex in a directory/folder
- 2. Run the pdflatex program on that file. That is, type

```
cd path/to/your/directory
and then
pdflatex file.tex
```

in cmd (Windows) or Terminal (Linux or Mac).

3. The program returns a pdf file or an error.

2.2 Commands and environments

2.2.1 Commands

A **command** starts with a backslash \ followed by one or more charaters. A command may have zero or more mandatory arguments and zero or more optional arguments. For example:

Table 1: Examples of commands and their arguments

Command	Arguments	Description
\\$	o mandatory o optional	Prints the \$ sign
\textbf	1 mandatory o optional	Prints its argument in boldface.
\\	o mandatory 1 optional	Forces a linebreak, with optional extra space
\footcite	1 mandatory 2 optional	Cites its mandatory argument, with optional pre- or post-notes (such as page numbers)
\footcites	n mandatory $2n+2$ optional	Multiple footcites

2.2.2 Environments

An environment looks like

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

It may have mandatory or optional arguments, which occur immediately after \begin{environment}.

Table 2: Examples of environments

Environment	Arguments	Description
document	none	The contents of the document.
figure	1 optional	Creates a section of a document which "floats" above the body of the text. Captions and cross-reference labels within a figure envi- ronment will refer to the figure. The optional argument restricts the placement of the figure on the page.
quote	none	Used to designate a long quote with additional margin.
smallbox	2 mandatory, 1 optional	Creates a box, limited to one column. The first argument is optional and specifies the position of the box. The second argument is mandatory and specifies the title of the box, the third argument is also mandatory and specifies the cross-reference label of the box.

3 Writing a report

3.1 The preamble

The **preamble** is everything outside the document environment. (*i.e.* everything after \begin{document}.

In every LATEX document, you must have

I. The command \documentclass and a valid document class. In our case, use

```
\documentclass{grattan}
```

2. A document environment.

That is, every LATEX document must have the following three lines.

```
\documentclass{<style>}
```

```
\begin{document}
\end{document}
```

3.1.1 Grattan-specific preamble

The grattan package will not compile without additional lines of code. Your preamble must have the following lines.

```
\documentclass{grattan}

\title{<Title of the report>}
\author{<Authors>}

\GrattanReportNumber{<number>} %% or
\GrattanWorkingPaperNumber

\addbibresource{bibliography.bib}
```

3.1.2 Other requirements

The .tex file must be in a directory containing:

- I. The grattan.cls file, which creates the document according to the Grattan template.
- 2. The bibliography. bib file, containing your bibliography database.
- 3. The folder FrontPage which must contain:
 - a) A file FrontPagePicture
- 4. The folder logos which must contain:

```
aus-gov-logo-stacked-black.eps-converted-to.pdf
aus-gov-logo-stacked-black.eps
Bhp.pdf
TMF_logo_black.eps
TMF_logo_green-eps-converted-to.pdf
TMF_logo_green.eps
UOM-Pos3D_S_Sm.jpg
UOM-Pos_S_PMS-eps-converted-to.pdf
UOM-Pos_S_PMS.eps
UOM-Rev_H_PMS-eps-converted-to.pdf
UOM-Rev_H_PMS.eps
UOM-Rev_S_PMS-eps-converted-to.pdf
```

```
UOM-Rev_S_PMS.eps
Vic_Gov_Logo-eps-converted-to.pdf
Vic_Gov_Logo.eps
```

3.2 Frontmatter

3.2.1 Overview / Summary / Preface

Use

```
\begin{overview}[-35pt]
...
\end{overview}
```

for your overview. The [-35pt] is a fudge factor that adjusts the position of the title to vertically balance the overview on the page. It may be abolished in future versions.

You can also use \begin{summary} as required. If you want to change the name of the frontmatter, ask us — it is straight-forward to amend.

3.2.2 Contents page(s)

Write

```
\contentspage
```

After the overview environment. This produces a list of figures and a list of boxes. If you don't want some of these lists, again, ask us — it is straight-forward to omit, but it is a matter for the class file maintainer.

3.3 Body text

3.3.1 Sectioning

To start a new chapter, write

```
\chapter{<chapter title>}
```

Similarly,

```
\section{<section title>}
\subsection{<subsection title>}
\subsubsection{<subsubsection title>}
```

Title commands increment as expected, except for \subsubsection which has no counter.

To start an appendix, type \appendix.

```
\appendix
```

to mark the end of the main matter and the start of the appendices. Then use \chapter{<appendix title>} to title the appendices.

For example:

```
\documentclass{grattan}
\title{Brief report}
\author{Me}
\begin{document}
\begin{overview}
In this report, we found all is well.
\end{overview}
\contentspage
\chapter{Australia is fine}
Australia is fine.
\section{How do we know this}
Grattan analysis of ABS (2016).
\subsection{Limitations of analysis}
Our analysis is wrong.
\chapter{Options for reform}
Tidy desk.
\appendix
\chapter{International comparisons}
\end{document}
```

3.4 Boldface, italics

In general, you should write what you *mean*, not what you want displayed. So avoid directly instructing LaTeX to bold or italicize test. Instead, write macros explaining *why* you are using a different font.

That said, you can use \textbf{<text>} to make text boldface and \textit{ <text>} to make <text> italic. You can also use \emphasize text.

3.5 Paragraphs

Use a blank line to mark a new paragraph. Thus

A well-designed GST reform package could support economic growth, make the tax and transfer system more progressive and give state and Commonwealth governments more budgetary options.

Proposals to extend or broaden Australia's 10 per cent goods and services tax (GST) have been perennial. Current governments face many challenges, such as funding growing healthcare costs, reducing deficits, and cutting inefficient taxes. A higher GST could fund any of these initiatives -- although perhaps not all of them.

3.6 Numbered / bulleted lists

Use enumerate and itemize

```
\begin{enumerate}
\item First numbered item
\item Second numbered item
\begin{enumerate}
\item First item in a nested list
\end{enumerate}
\item Third numbered item
\end{enumerate}

\begin{item ize}
\item First bulleted item
\item Second bulleted item
\begin{item ize}
\item First nested bulleted item.
\end{itemize}
\item First nested bulleted item.
\end{itemize}
\end{itemize}
\end{itemize}
\end{itemize}
```

3.7 Floats

3.7.1 Figures

Before you insert a figure, you need to create your image. This can either be done directly through a scripting language (like R or python), through LATEX directly (as through TikZ), or through an external program. Your file should be a pdf, though almost all image types are supported. If you are going through an external program, ensure the file is moved to the atlas directory of your report. This directory should be placed in the same directory as your .tex file. The directory should be called something evocative, like figure, as it is in this manual.

Once the image is ready, use the following structure to insert a figure.

```
\begin{figure}
  \caption{<main caption>\label{<cross-reference key>}}%
  \units{<secondary caption/y-axis label>}
  \includegraphics[width=\columnwidth] {figure/image-filename}
  \noteswithsource{<Notes of the chart>}%
  {<Source information>}
  \end{figure}
```

3.7.2 **Tables**

Tables are tricky in Lagrangian Teach and the specific width. Let \columnwidth be the table's width.

```
\begin{tabularx}{\columnwidth}{<alignment parameters>}
\toprule
Header1 & Header2 & Header3 \\
\midrule
First row & First row & First row \\
Second row & Second row \\
...
Last row & Last row & Last row
\bottomrule
\end{tabularx}
```

The <alignment parameters> determine the alignment of the columns, 1 for left-aligned, c for centre-aligned, r for right-aligned. Others are available. Use the double-backslash \\ to move to the next row and the ampersand & to move to the next column. Use \toprule before the first row, \bottomrule after the last row, and \midrule to separate the headers from the rest of the table.

More advanced

```
\cmidrule(lr){<m-n>}
    to denote a horizontal rule between the mth and nth
    columns. The (lr) specifies that the horizontal rule should
    stop just short of the edges of the columns, to ensure adja-
    cent \cmidrules have a visual breath between them.

\multicolumn{<n>}{<al.>}{<text>}
    Puts the <text> in a 'merged' cell from the current cell across
    <n> columns with horizontal alignment <al.>
```

```
\newcommand{\tblHeadR}[2][c]{\bfseries\begin{tabular}[#1]{@
   {}>{\rangedleft}p{\linewidth}@{}}\#2\end{tabular}}
\begin{table}
\caption{Budgetary impact of income tax rate changes}\label{
   tbl:tax_cuts}
\begin{tabularx}{\columnwidth}{lr>{\raggedleft\arraybackslash}
   X}
\toprule
\tblHead{Tax bracket} & \tblHead{Current tax rate} &
   \tblHeadR{Budgetary impact of 1 percentage point change
   (2015-16)}\\
\midrule
\$0-\$18,200 & 0\% & \\
\$18,201 - \$37,000 & 19\% & \$1.9\\
\$37,001 - \$80,000 & 32.5\% & \$2.3\\
\$80,001 - \$180,000& 37\% & \$1.3\\
\$180,001 + & 45\% & \$0.7\\
\bottomrule
\end{tabularx}
\notes{Excludes Temporary Budget Repair Levy (2\%\ for those
   earning over \$180,000 until 2016-17)}
\source{Grattan analysis ATO 2\%\ sample file (2013). See
   \url{https://grattan.shinyapps.io/Changing_income_taxes/
   Forty_three_app.Rmd}}
\end{table}
```

3.8 Boxes

3.8.1 smallbox

Use \begin{smallbox} to insert a box intended to fit on one column. There are two mandatory arguments.

```
\begin{smallbox}{<title of the box>}{box:<cross-ref key>}
  <contents of the box>
\end{smallbox}
```

3.8.2 bigbox*

Use \begin{bigbox*} to denote a big box. The text will flow around the box. When you have a figure in a big box, you must use

¹The * reflects a convention in LATEX for a two-column float in an environment name.

```
\begin{figure}[H]
...
\end{figure}
```

to insert a figure.

Note the [H] which specifies that the figure is to be placed here (or rather, *HERE!*).

3.9 Cross-references

There are three commands used in cross-referencing: \label, Vref and Cref. The first designates the target of a cross-reference; the other two are for making a cross-reference to such a target.

For example, to refer to some figure

```
Some text which is illustrated by a chart (\Vref{fig:key})

\begin{figure}
  \caption{The chart's caption\label{fig:key}}
  \includegraphics{thechartfilename.pdf}

\end{figure}
```

3.10 Footnotes and referencing

Use the command \footnote to mark a footnote. Use \textcite within a footnote.

3.10.1 bibliography.bib

The bibliography.bib file is a plain text containing the bibliography databases. The database contains several lines for each entry:

```
@type{<key>,
  author={<author name>},
  title={<title>},
  year={<year>}
}
```

There are several elements to a bibliography:

Otype This specifies the type of reference, such as an article, report, book.

<key> This is a string of text or numbers (no spaces or special characters) which represent the key which is referenced in the text (as I will show below).

uthor=<author name> each of these lines designate the fields of the reference

3.10.2 Citations

Use \footcite{< key>} to cite an entry in the database. The citation will appear in a footnote. Use \footcites{< key1>}{< key2>} to cite multiple entries in the same footnote.

Use \footcite[] [18--24] ${\langle key \rangle}$ to add a page reference (in this case, pages 18-24) as a postnote the citation. Use \footcites {key1}[] [44] {key2} to cite key1 and page 44 from key2.

Use \textcite(<key>) to cite a key if you don't want in a footnote. Similarly \textcites and \textcite[][18--24]{key} as with footcite.

4 More advanced macros

4.1 New commands

Use \newcommand to create a new command.

```
\newcommand{<command name>}{<what the command does>}
\newcommand{<command name>}[<number of arguments>]{<what the
    command does as a function of #>}
```

For example,

```
\newcommand{\eg}{\emph{e.g.}}
```

Creates a newcommand \eg which prints *e.g.* when it is called. Another one I often use is:

```
\newcommand{\gao}{Grattan analysis of}
```

Slightly more advanced is

```
\newcommand{\defi}[1]{\textbf{#1}\index{#1}}
```

This makes the argument of \defi bold and places it in the index.

5 Compiling a final document

5.1 Citations and references

If your file is called YourReport.tex

```
texify --pdf --clean YourReport.tex
```

2. Update bibliography

```
biber YourReport
```

Note that you should not provide the extension for biber.

3. Re-run:

texify --pdf --clean YourReport.tex

- 6 Known bugs in the grattan.cls file
- 6.1 Big boxes
- 6.1.1 Caption baseline does not match matching column baseline

 ${f Solved:}$ http://tex.stackexchange.com/questions/305450/align-caption-baseline-in-second-column

- 6.2 Footnotes in big boxes extend across the entire page
 - 7 pdflink errors

Use \nocite{*} and delete all auxiliary files to escape the error.

Part I.

Notes for the typesetter

8 Moving floats

- I. If the author would prefer a float (figure, table, or box) to be placed in a different location in the document, you as the typesetter must first understand why the output routine has placed the figure where it has.
- 2. If it is clear that the output routine has averted a substantial typographic sin by placing the figure there, the author should be told of this.
- 3. Otherwise, the first step is to move the errant float forward or backward one or two paragraphs as required, noting that the order in which floats of the same type (*e.g.* figure) occur in the source file is preserved in the final document.
- 4. Next consider, in the following order:
 - a) providing the options [htb] as required to the float environment
 - b) providing the same options to the errant float's predecessor
 - c) providing the same options to both the errant float and its predecessor
- 5. At this point, if the figure remains steadfast, you have encountered a very unusual situation, and I would encourage you to accept the result.

- 6. Otherwise: you should consider rewording captions or the surrounding text.
- 7. Next consider the use of \FloatBarrier
- 8. Then consider the option!.
- 9. As an emergency measure, you can manually place the figure using the option H.
- 10. As a last resort, consider using primitive TEX to manually place the figure with respect to the page. This should be the very last step in a publication.

9 Bad page break

Consider using:

- I. \pagebreak[1] at a good/better place for line breaking:
- 2. $\ensuremath{\mbox{\mbox{\mbox{\sim}}}\ or\ensuremath{\mbox{\mbox{\mbox{\sim}}}\ where <n>\ is an integer multiple of 1/4.$

10 Excessive whitespace between paragraphs

This occurs when there is insufficient text to fill a page (the page is *underfull*) but moving text onto another page is not possible because:

- A section would be orphaned from its title
- A footnote would have to be set on a different page from its mark.
- 1. Reposition floats if useful.
- 2. Use \oneraggedpage:

```
% one page ragged bottom
\makeatletter
\newcommand{\oneraggedpage}{\let\mytextbottom\@textbottom
\let\mytexttop\@texttop
\raggedbottom
\afterpage{%
\global\let\@textbottom\mytextbottom
\global\let\@texttop\mytexttop}}
```

3. Finally, use \raggedbottom on the entire document. Review.

11 Hyphenation

Hyphenation can be distracting and interrupt the text; however, the alternative to hyphenation is often worse.

When the text is typeset ragged right, LETEX will actually be *more* inclined to hyphenate. If full-width justification on a paragraph can be used, it will minimize discretionary hyphens.

ETEX will, by default, avoid hyphenating words, and desperately try to avoid putting discretionary hyphens on consecutive lines or at a page break.

If a paragraph in your report contains unsightly hyphenation (*i.e.* consecutive hyphens or hyphenation across pages), the best and perhaps only solution is to reword the paragraph.

In the unlikely event that rewording the paragraph does not change the hyphenation, you can increase \emergencystretch to 0.5em. Note that you in doing so are take responsibility for the typesetting of that paragraph. You may wish to play around with penalties, but you should do so with trepidation and only ever locally.

Never use \raggedright in ordinary body text. It is acceptable in text where each "paragraph" is really an isolated verse or element. For example, it is acceptable in a list of recommendations, in a table, or in the captions to figures. Although in deploying \raggedright you win certainly the battle regarding excessive hyphenation, you lose the war – the text can become badly ragged – and paragraphs will need to be reworded.

Table 3: List of all commands

\Command	Comment	Group
\boxsources	Source matter within boxes	Boxes
\citetitle	Inserts the title of a citation, as well as including the reference in the bibliography.	Citations & bibliogra
\footcite \footnote \textcite	Citation to be placed in a footnote Multiple citations to be placed in a footnote Insert a footnote. Inline citation	Citations & bibliogra Citations & bibliogra Citations & bibliogra Citations & bibliogra
\textcites	Multiple citations to be placed inline	Citations & bibliogra
\Cref \Vref \label \phantomsection	Subsequence cross-reference (to a \label) Initial cross-reference (to a \label) The target of a cross-reference. If the target of a cross-reference is not a figure, table, or section (<i>i.e.</i> it occurs in the middle of a paragraph), use \phantomsection\label <key> to anchor the cross-reference</key>	Cross-referencing Cross-referencing Cross-referencing Cross-referencing
\bottomrule	Final horizontal rule in a table	Figures and tables
\caption \captionwithunits	General caption (grey, bold) Caption with first argument top line and second argument units for chart	Figures and tables Figures and tables
\cmidrule \columnwidth \fnotes	Horizontal rule over a subset of columns Supplies the current width of the column Figure notes that are long	Figures and tables Figures and tables Figures and tables
\tnotes	Table notes that are long	Figures and tables
\includegraphics \linewidth \midrule \multicolumn	inserts an image (typically a pdf) using the file provided Current width of line Horizontal rule separating heading from contents in a table Spread a cell over multiple columns (merge cells)	Figures and tables Figures and tables Figures and tables Figures and tables
\notes \source	Puts notes under a chart Puts source text under a chart	Figures and tables Figures and tables
<pre>\noteswithsource \toprule \units</pre>	Puts notes and source under a chart/table First horizontal rule in a table Units for charts	Figures and tables Figures and tables Figures and tables
<pre>\emph \textbf \textit</pre>	Emphasize text with an oblique font Boldface Italic font (oblique font for Arial)	Fonts Fonts Fonts
\item	Commence new number or bullet in an enumerate or itemize environment	Lists
\ie \input	Macro for consistent use of 'i.e.' Used to insert raw .tex code from another file	Misc Misc
\addchap \chapter \section \subsection	Chapter without number Begins a new chapter, first argument the title of the chapter Section title Subsection title	Sections Sections Sections
\addbibresource \acknowledgements \author \contentspage	The path of the bibliography (.bib) file containing the references Text appearing in second column of page 2 The authors of the report Load after the overview. Prints the table of contents and the list of figures	Single-use Single-use Single-use Single-use
\documentclass \GrattanReportNumber \GrattanWorkingPaperNumber \listoffigures \listoftables	Used at the top document. Loads the class (grattan) Prints the report number on page 2 Prints the working paper number on page 2 Print list of figures (currently handled by \contentspage) Prints list of tables	Single-use Single-use Single-use Single-use Single-use

Table 3: List of all commands

\end{recommendations}

, and the second se				
\Command	Comment		Group	
\printbibliography \printendnotes \printfigurenotes \printtablenotes \title	Prints bibliography Prints endnotes if requested Prints list of 'long figure notes' by \fnotes Prints list of 'long table notes' by \tnotes The title of the report		Single-use Single-use Single-use Single-use Single-use	
\\$ \% \&	\\$ for a (literal) dollar sign \% for a (literal) percentage sig Literal ampersand logogram	gn	Special characters Special characters Special characters	
 \@ \\	Half-space kern Use ∖@ before a sentence-end Line break in table	ing full stop preceded by a capital letter	Technical Technical Technical	
	Dlagos	a floating figure with caption, notes, and s	2011#20	
{Units}% {xrefkey} path/t \notes{Notes} \source{Source}	o/figure}			
<pre>\begin{table} \caption{Table caption} \begin{tabularx}{\linew \toprule ColumnHeader1 & ColumnH \midrule Table entry 1 & Table e \bottomrule \end{tabularx} </pre>	idth} eader2 \\	a floating table with caption, notes, and so	ource.	
f \end{table} \begin{overview}[-25pt] \end{overview}	Page o	f overview and recommendations.		
\begin{recommendations}	[-25pt]			

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