Typesetting math

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26 September 2016

Abstract

I explain how to set mathematical type in a word processor, and introduce more advanced tools such as Microsoft Equation Editor, LibreOffice Math, or LaTeX.

1 Introduction

Writing in the social sciences (including economics and business) often requires mathematical typesetting. Many writers use a word processor, but few know how to properly typeset symbols, formulas, or computations with a word processor. As a result, the documents they produce look unprofessional. Even worse, they often are unclear or contain mistakes. I explain how to typeset symbols, equations and formulas in a word processor (iWork Pages, LibreOffice Writer, or Microsoft Word). For undergraduate students in the social sciences, sections 2 and 3 will suffice. For those who need more advanced tools, I briefly introduce Microsoft Equation Editor, LibreOffice Math, and LaTeX (section 4).

2 Symbols

Italicize scalar variables, statistics, and parameters ($x, \mu, Q_1, ...$). For a **multiplication**, don't type an asterisk (*) or the letter "x" but use the proper multiplication symbols $\times$ or $\cdot$ (3×4 or $3 \cdot 5$). To type **mathematical symbols** such as $\neq$, $\approx$, or $\times$ or **Greek characters** such as μ, σ, or ρ use:

- Pages: Edit $\rightarrow$ Emoji & Symbols $\rightarrow$ Math Symbols

- Writer: Insert $\rightarrow$ Special characters $\rightarrow$ (choose Symbol font) (select the symbol you want to insert) $\rightarrow$ OK

- Word: Insert $\rightarrow$ Symbol ... $\rightarrow$ (choose Symbol font) (select the symbol you want to insert) $\rightarrow$ Insert $\rightarrow$ Close

Another way to type Greek characters is to use the Symbol font: for μ type m, select the m, and change in the toolbar the font to Symbol (for σ, type s; for ρ, type r; etc.). You can easily access special characters from any application in macOS by using the Keyboard Viewer (see Snider (2015)).

To type **subscripts** and **superscripts**, select the character you want to change into a subscript or superscript, and choose in the menu:

- Pages: Format → Font → Baseline → Superscript (or Subscript)

- Writer: Format → Character → Position → (check the subscript or superscript box)

- Word: Format → Font → (check the subscript or superscript box)

Add subscript and superscript commands to the toolbar:

- Pages: View → Customize Toolbar → (drag superscript and subscript icons to toolbar)

- Writer: Tools → Customize → Toolbars → Formatting → (scroll down to the A^A superscript and A_A subscript icons, and check the boxes)

- Word: Tools → Customize → Commands → Format → (scroll down to the A^2 superscript and A_2 subscript icons, and drag the icons to your toolbar)

If you now want to type subscripts and superscripts, select the character you want to change into a subscript or superscript and click on the appropriate icon in the toolbar.

You can't type $\hat{x}$ or $\bar{x}$ directly in Pages, Writer, or Word. A workaround is to type "x-hat" and "x-bar" instead. How to typeset $\hat{x}$ or $\bar{x}$ (and more complicated expressions) is explained in section 4.

3   Formulas

Start a new line and indent or center formulas, as shown in the examples below. Simple formulas can be typeset in a single line:

$$z = (x - \mu)/\sigma$$

... but make sure that you use brackets when needed:

$$z = (x - \mu)/\sigma \quad \text{is not the same as} \quad x - \mu/\sigma$$

Verify:

$$(6 - 4)/2 = 2/2 = 1$$

but

$$6 - 4/2 = 6 - (4/2) = 6 - 2 = 4$$

Typesetting in-line also works when you have longer variable names and units of measurement, as in the following paragraph:

GDP per capita is defined as:

$$\text{GDP/population}$$

For the U.S., GDP per capita in 2013 was

$$\text{USD } 16\,800 \text{ billion}/320 \text{ million people} \approx \text{USD } 52\,491 \text{ per person}$$

In most cases typesetting equations in-line as shown above will do just fine. Do remember however that a word processor document depends on the fonts that are installed on the computer you use to open the document. For that reason, some characters (such as $\approx$) may not be displayed or printed properly when you display or print the document on a computer different from the one you used to create the document. You may find that a Word document that looked fine on your computer at home will be messed up when you print it from a computer in the university computer room (the word processor typically displays a $\square$ for any symbol that it doesn't know). To avoid this problem, export the word processor document on your own computer to a portable document file (pdf), and—if you have to print the document from another computer—print the pdf, not the document in word processor format (.pages, .odt, or .doc). To export a word processor document to pdf, do the following:

- In macOS choose File $\rightarrow$ Print in the program you used to create the document, and in the Print window click the PDF button on the bottom left. Select Save as PDF.

- If you use Microsoft Word under Windows select Export $\rightarrow$ Create PDF/XPS Document.

If you don't need anything more fancy than what was covered above, you can skip the remainder of the paper.

4 More advanced tools

For simple equations and equations that contain variable names like "GDP" or units of measurement like "billions of dollars," stick to in-line typesetting. To typeset complicated formulas such as

$$s_{xy} = \frac{\sum (x_i - \bar{x})(y_i - \bar{y})}{n - 2}$$

you need more advanced tools.

4.1 LibreOffice Math

If you write your document in LibreOffice.org Write, use LibreOffice's equation editor Math to set complex mathematical type. For an introduction read The Document Foundation (2014, Chapter 9: Getting Started with Math).

If you want to insert a formula in an LibreOffice Write document, do Insert $\rightarrow$ Object $\rightarrow$ Formula. You can also use LibreOffice Math as a standalone application: choose File $\rightarrow$ New $\rightarrow$ Formula. You can ask for Help from within the Math application; the LibreOffice Math help function explains how to use Math—see the section "LibreOffice Math features."

LibreOffice Math use markups. For example, the command to typeset the equation

$$z = \frac{x - \mu}{\sigma}$$

is:

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z = {x-%mu} over {%sigma}
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The command to typeset equation

$$\sigma_{xy} = \frac{\sum (x_i - \mu_x)(y_i - \mu_y)}{N}$$

is:

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%sigma_{xy} = {sum  {(x_i-%mu_x)(y_i-%mu_y)}} over {N}
```

The markups are quite intuitive and templates in LibreOffice Math facilitate the work. Table 1 shows some commonly used expressions and the corresponding Math markups to typeset them; the table also includes the very similar LaTeX markups. See section 4.5 for more on LaTeX.

Table 1: Some examples of LibreOffice Math and LaTeX markups

Output	LibreOffice Math	LaTeX
x_i	x_i	x_i
$\sqrt{x}$	sqrt{x}	\sqrt{x}
x^2	x^2	x^2
$x \approx 2.34$	x approx 2.34	x \approx 2.34
μ, σ	%mu, %sigma	\mu, \sigma
$\hat{x}$	hat x	\hat{x}
$\bar{x}$	bar x	\bar{x}
$\sum x_i$	sum x_i	\sum{x_i}
2×3	2 times 3	2 \times 3

4.2 Microsoft Equation Editor

Microsoft Equation Editor is a little-known extra program included with Microsoft Office. You may already have installed Microsoft Equation Editor. To check this, open a Microsoft Word document and use the menu item: Insert → Object ... → Microsoft Equation. If you don't see the option "Microsoft Equation," Microsoft Equation Editor is not yet installed. If you obtained Microsoft Office on a CD-ROM or DVD, run the installation procedure and check the appropriate box.

Microsoft Equation Editor is an easy-to-use menu-driven graphical typesetter that will suffice for most undergraduate work (unless you are majoring in mathematics, physics, or engineering). To call Equation Editor in Word, use the menu item: Insert → Object ... → Microsoft Equation.

To learn about its features, read the Help function and play around with the menu options. You can also run Microsoft Equation Editor as a stand-alone application, and cut and paste equations in your text editor, Write, or Pages documents. MathType is and expanded professional (and quite expensive) version of Equation Editor.

4.3 Roger's Online Equation Editor

Roger's Online Equation Editor (`http://rogercortesi.com/eqn/`) allows you to create equations that can be pasted into documents. It requires some knowl-

edge of LaTeX markups, but the sample equations provided on the web page will get you a long way.

4.4   Grapher (macOS)

The Grapher application (in the Utilities folder of macOS) can be used to typeset simple equations. Open Grapher and choose File → New → Default.... Click the Choose button. A new window opens showing $y =$ and the blinking cursor. Now select in the menu: Window → Equation Palette. A window with equation templates opens. Type the equation. Select the equation and choose Edit → Copy as...→ TIFF. You can now paste the equation into your word processor document.

4.5   LaTeX

This document is typeset using LaTeX (pronounced as "lah-tech"). LaTeX is a free program for typesetting research reports that creates beautiful documents that are portable across platforms. It runs on any platform (macOS, Windows, Linux, Unix). If you plan to write a master's paper with substantial technical content (such as mathematical type), a master's thesis, a doctoral dissertation in economics, or if you just want to produce reports that are beautifully typeset, learn how to use LaTeX. The best quick introduction to LaTeX is Griffiths and Higham (1997)—a rare thing: a technical manual that is concise (84 pages), well-written, and that will have you laugh out loud from time to time. In a macOS, I recommend TeXShop (`http://www.texshop.org`, Mac only). On other platforms, there is the TeXmaker editor (`http://www.xm1math.net/texmaker/`).

References

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The Document Foundation (2014). *LibreOffice 4.2 Getting Started Guide*. The Document Foundation, s.l.