My thesis

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April 4, 2014

1 Introduction

Once upon a time there was a lonely honours student, desperate to write an awesome thesis. She hit upon the idea of making it look beautiful by using a mathematical document preparation system.

2 Literature review

In printing, text is emphasized by using *italics*, or possibly using **bold**.

Footnotes[1] pose no problem.

A frequently-displayed structure is a list. The following is an example of an *itemized* list.

- This is the first item of an itemized list. You can select other bullet types if you want using additional packages.
- This is the second item of the list.

We can also have *enumerated* lists:

1. This is the first item of an enumerated list. The numbering of items is automatic. You can enumerate lists with (a), (b), etc., or some other scheme. Using 1., 2., etc., is the default.
2. This is the second item of the list.

3 Mathematics

For mathematics, wrap symbols in $ signs. For example, $x - 3y = 7$ or $a_1 > x^{2n}/y^{2n} > x'$. Remember that a letter like x is a formula when it denotes a mathematical symbol, and should be treated as one.

Mathematical formulas may also be displayed. A displayed formula is one-line long; multiline formulas require special formatting instructions.

$$x' + y^2 = z_i^2.$$

[1] This is an example of a footnote.

Don't start a paragraph with a displayed equation, nor make one a paragraph by itself.

Numbered equations are also useful:

$$\bar{y} = \frac{1}{n}\sum_{i=1}^{n} y_i \tag{1}$$

Clearly, equation (1) gives the sample mean. The sample standard deviation can be calculated similarly:

$$s_y = \sqrt{\frac{1}{n-1}\sum_{i=1}^{n}(y_i - \bar{y})^2}. \tag{2}$$

Here is a section from a paper I am writing showing some additional features along with citations. The Poisson model (Smith & Miller 1986) is given by

$$y_t \sim \text{Poisson}(x_{t-1}) \tag{3a}$$
$$x_t = x_{t-1}\eta_{t-1}/\lambda \tag{3b}$$

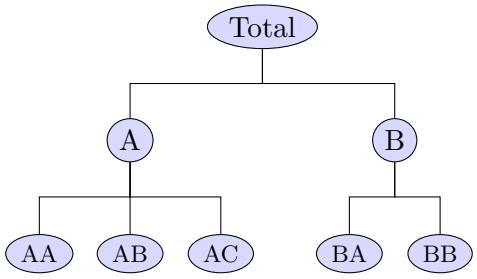
where $\eta_t \sim \text{Beta}(\lambda b_t, (1-\lambda)b_t)$, $b_t = \lambda b_{t-1} + y_t$, and $0 < \lambda < 1$. Here we use the $\text{Beta}(\alpha, \beta)$ density $f(x) \propto x^{\alpha-1}(1-x)^{\beta-1}$, $0 \le x \le 1$. Equivalently,

$$x_t = \lambda^{-t} x_0 \prod_{i=1}^{t} \eta_i. \tag{4}$$

Harvey & Fernandes (1989) show that (3) has the EWMA forecast function

$$\text{E}(y_{t+h} \mid \mathcal{I}_t) = (1-\lambda)\sum_{j=0}^{t-1} \lambda^j y_{t-j}.$$

You can even draw pictures:



References

Harvey, A. C. & Fernandes, C. (1989), 'Time series models for count or qualitative observations (with discussion)', *Journal of Business & Economic Statistics* **7**, 407–422.

Smith, R. L. & Miller, J. E. (1986), 'A non-Gaussian state space model and application to prediction of records', *Journal of the Royal Statistical Society (Series B)* **48**, 79–88.