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Notes on Pairs Trading

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Contents

1 Introduction

A basic pairs trading strategy consists of exploiting an out-of-equilibrium market; if two assets typically trade at some spread, then the narrowing/widening of the spread between the assets may be exploited for profit For example, if the spread widens, then one should buy the low asset and short the high asset. On the other hand, if the spread narrows, than one should short the higher asset and buy the lower asset.

Consider a state process $\{x_k\}$, where x_k denotes the value of a real variable at the time $t_k = k\tau$, where τ is the separation between times and $k = 0, 1, 2, \ldots$. We assume that $\{x_k\}$ is mean-reverting, meaning we have the following relation between the spread of susequent pairs of x_k:

$$x_{k+1} - x_k = (a - bx_k)\tau + \sigma\sqrt{\tau}\varepsilon_{k+1}, \tag{1.1}$$

where $\sigma \geq 0, b > 0, a \in \mathbf{R}$, and $\{\varepsilon_k\}$ is iid Gaussian $\mathcal{N}(0, 1)$ and independent of x_k. With this definition, the process reverts to $\mu = a/b$ with *strength* b. This implies that

$$x_k \sim \mathcal{N}(\mu_k, \sigma_k^2), \tag{1.2}$$

where

$$\mu_k = \frac{a}{b} + \left[\mu_0 - \frac{a}{b}\right](1 - b\tau)^k, \tag{1.3}$$

and

$$\sigma_k^2 = \frac{\sigma^2\tau}{1 - (1 - b\tau)^2}\left[1 - (1 - b\tau)^{2k}\right] + \sigma_0^2(1 - b\tau)^{2k} \tag{1.4}$$

We discourage the use of inline figures (wrapfigure), as they may be difficult to position if the page layout changes.

We suggest not to abbreviate: “section”, “appendix”, “figure” and “table”, but “eq.” and “ref.” are welcome. Also, please do not use `\emph` or `\it` for latin abbreviaitons: i.e., et al., e.g., vs., etc.

Figure 1. Always give a caption.

x	y	x and y
a	b	a and b
1	2	1 and 2
α	β	α and β

Table 1. We prefer to have borders around the tables.

2 Sections

2.1 And subsequent

2.1.1 Sub-sections

Up to paragraphs. We find that having more levels usually reduces the clarity of the article. Also, we strongly discourage the use of non-numbered sections (e.g. `\subsubsection*`). Please also see the use of "`\texorpdfstring{}{}`" to avoid warnings from the hyperref package when you have math in the section titles

A Some title

Please always give a title also for appendices.

Acknowledgments

This is the most common positions for acknowledgments. A macro is available to maintain the same layout and spelling of the heading.

Note added. This is also a good position for notes added after the paper has been written.

References

[1] Author, *Title*, *J. Abbrev.* **vol** (year) pg.

[2] Author, *Title*, arxiv:1234.5678.

[3] Author, *Title*, Publisher (year).