



Banff International Research Station
for Mathematical Innovation and Discovery

Non-Gaussian Multivariate Statistical Models and their Applications
May 19-24, 2013

Pros and cons of skew-symmetric distributions and copulas –
Discussion

Moderated by Chris Adcock

1. Introduction

- Use of non-normal multivariate distributions presents many challenges.
- Different opportunities and problems.
- Proposed structure of this discussion:
 1. Review a list of headings.
 2. Discuss pros and cons under them.
- This is a linear approach. Doubtless the discussions will be non-linear!
- Output? Re-invigoration of existing streams of research, list(s) of potential research projects.

Consulted: Alex, Arthur, Bala, Barry, Christian, Harry, Marc.

2. List of Pros and Cons

- I Specification of marginal probabilities and tail probabilities.
- II Theoretical basis of the dependence structure.
- III Natural occurrence.
- IV Parametrization/reparametrization.
- V Estimation & inference.
- VI Applications.
- VII Scope.
- VIII Simulational complexity.
- IX Alternative models.
- X Last but not least...

I - Specification of marginal probabilities and tail probabilities

- This is the obvious difference!
- Computation thereof.
- 2, 3,dimensional tail probabilities.

II - Theoretical basis of the dependence structure

- Understanding the shape characteristics and features.
- Shape flexibility; model features in real data.
- What does the dependence structure mean in terms of the underlying theory for the application in question?

- **III - Natural occurrence**

- Sample selection models/bias, distribution of maxima, and alike.
- Does data-generating mechanism lean to one family or another?
- When is it a case of what 'fits' best?

IV - Parametrization/reparametrization

- Aim for parameter orthogonality
- Parameters of interest in applications.
- Are parameters of interest individually or jointly?
- Confidence intervals for individual parameters or groups thereof.

V - Estimation & inference

- Number of dimensions.
- Traditional methods.
- Robust methods.
- Tests of hypothesis and model selection.

VI – Applications

- Ease of use for applications.
- Ease of use in cognate disciplines.
- Are there typical applications for each?

VII – Scope

- Handling continuous and discrete variables.
- Time series models.
- Theoretical tractability.

VIII - Simulation Complexity

- Computer intensive methods.
- Asymptotic results cannot be relied upon.
- Availability of exploitable stochastic representations?

IX - Alternative models

- What others approaches are there?
- For example, elliptically symmetric vector + vector with arbitrary distribution.

Last but not least.....

X - Very many dimensions!

There are 500 stocks in the S&P500.....

Thank you....