

INTRODUCTION TO THE THEME ISSUE: THE SKEW-NORMAL AND RELATED DISTRIBUTIONS

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It is with pleasure that we present this theme issue on: **The skew Normal and related distributions**, motivated by the workshop held on November 6th, 2017 in memory of Antonella Capitanio, one year after her premature loss. The programme of the workshop is reported in Figure 1; many of Antonella's friends and co-authors participated and gave talks related to Antonella's research. In Figure 2 we show the last slide of the presentation of Reinaldo Boris Arellano Valle that shows a picture of him and Antonella, together with a sentence based on a poem by Neruda that he dedicated to her.

The first contribution in this theme issue contains the transcript of the conversation held at the aforementioned workshop between Angela Montanari, Adelchi Azzalini and Narayanaswamy Balakrishnan, where the latter two authors described their scientific collaboration and experience with Antonella. The conversation has been edited and enriched as to include many of the pictures that Azzalini and Balakrishnan showed on that day. We thank them for their kind feedback and the commitment to the piece and we believe the final result manages to reproduce the touching atmosphere of that day and to convey some of the peculiar traits of Antonella's character.

The second article re-proposes the last unpublished work of Antonella Capitanio on mixtures of skew normal distributions. This was originally deposited by Antonella on the ArXiv public repository (Capitanio, 2012) and is reproduced here with the kind permission of her family. In particular, the canonical form of scale mixtures of the multivariate skew-normal distribution is defined and a method that allows to obtain the linear transform that converts a scale mixture of multivariate skew-normal distribution into a canonical form is presented. Some results regarding the multivariate skew t distribution are also proposed.

We also take the opportunity to re-present a paper by Adelchi Azzalini, published in Statistica in 1986 (Azzalini, 1986), together with corrections, comments and a historical

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DIPARTIMENTO DI SCIENZE STATISTICHE
"PAOLO FORTUNATI"

Workshop to celebrate Antonella Capitanio

November 6th, 2017

ROOM 1 – Via delle Belle Arti, 41 – 40126 Bologna.

The Department of Statistical Sciences, University of Bologna, is hosting a workshop in memory of Antonella Capitanio, one year after her premature death. This meeting also represents the opening event for the 2017-2018 academic year of the PhD Program in Statistical Sciences in which Antonella taught probability with great passion and originality.

Program

9:30 - 10:00 *Opening*

10:00 - 11:00 A conversation with Adelchi Azzalini (University of Padua) and Narayanaswamy Balakrishnan (McMaster University)

11:00 - 11:20 *Coffee break*

11:20 - 12:00 Marc Genton (King Abdullah University of Science and Technology) - "*Assessing potential wind energy resources with a skew-t distribution*"

12:00 - 12:40 Reinaldo Arellano Valle (Pontificia Universidad Católica de Chile) - "*Scale and shape mixtures of multivariate skew-normal distributions*"

12:40 - 14:00 *Lunch*

14:00 - 14:40 Pier Luigi Conti (La Sapienza University of Rome) - "*On the estimation of the renewal function: a Bayesian approach*"

14:40 - 15:20 Estela Bee Dagum (University of Bologna) - "*A comparison of new developments of the Henderson filters for real time trend-cycle analysis*"

15:20 - 16:20 Contributed paper session:

Brunero Liseo (La Sapienza University of Rome) and Antonio Parisi (Università Tor Vergata, Roma) - "*Bayesian methods for the multivariate skew-t distribution*"

Maria Rosaria Ferrante (University of Bologna) and Silvia Pacci (University of Bologna) - "*Small domain estimation of business statistics by using multivariate skew normal models*"

Bruno Scarpa (University of Padua) and Lucia Zanotto (University of Padua) - "*Indexes to measure kurtosis applied to multivariate skew-normal distribution*"

16:20 - 16:30 *Conclusions*

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Figure 1 – Programme of the workshop.

La Chascona y El Poeta ...

... por la enrespada y alta luz de tus cabellos, yo te llamo dulcemente la chascona cara amica,... y como quisiera que supieras que el mundo skew ya no es lo mismo sin tu presencia...

Figure 2 – Last slide of the presentation of Reinaldo Boris Arellano Valle that contains a sentence based on a poem by Neruda that he dedicated to Antonella.

account from the author. This was a follow-up of the seminal 1985 article (Azzalini, 1985) that is generally considered to have initiated the subject of skew-normal distributions. As mentioned by the author, the 1986 paper has always been less accessible than other contributions, partly because of the limited international diffusion of *Statistica* and also because it was not available in electronic format. Still, it counts more than 600 citations (as of September 2020) and we hope the present initiative will contribute further to its diffusion.

The last piece, by Howell Tong and Dong Li, concerns the interesting relationship between skew symmetric distributions and threshold autoregressive models. One of us (SG), works in nonlinear time series analysis, has been a student of Howell Tong and has been influenced by his pioneering work. In recent years, Howell Tong has been visiting regularly the Department of Statistical Sciences of the University of Bologna and this fruitful interaction gave us the opportunity to ask him and Dong Li to contribute to the theme issue, which they kindly agreed upon. By the way, we concur with the authors' view that a probability distribution is interesting and meaningful if there is a dynamical process behind it. The connection between threshold autoregressive processes and skew-symmetric distributions is one of such instances and we hope that this article within the theme issue will contribute to reinforce the awareness of such connection that seems to have remained relatively under-appreciated.

ACKNOWLEDGEMENTS

The authors would like to thank the Executive Editor prof. Mariagiulia Matteucci and

the Executive Editor Support dr. Emanuela Lezzi for the excellent work and support throughout the preparation of the theme issue. We also thank Patrizia Capitanio for the permission to reproduce the work of Antonella.

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SUMMARY

This theme issue on the skew Normal and related distributions is motivated by the workshop held on November 6th, 2017 in memory of Antonella Capitanio, one year after her premature loss. The issue contains the transcript of the conversation between Angela Montanari, Adelchi Azzalini and Narayanaswamy Balakrishnan regarding their scientific collaboration with Antonella. Moreover, the last unpublished work of Antonella Capitanio on mixtures of skew normal distributions is reproduced here with the kind permission of her family. We also take the opportunity to re-present the seminal 1986 Azzalini paper, together with corrections and comments from the author. The last contribution, by Howell Tong and Dong Li, concerns the interesting relationship between skew symmetric distributions and threshold autoregressive models.

Keywords: Antonella Capitanio; Skew symmetric distributions; Threshold autoregressive processes.