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School of Mathematical Sciences | Lancaster University

March 9th, 2025

To whom it may concern,

Review report: Habilitation Thesis, Mgr. Vladimír Holý, Ph.D.

I write this report as Distinguished Professor of Statistics at Lancaster University, where I am Director of the EPSRC-funded STOR-i Centre for Doctoral Training and lead Lancaster's internationally recognised research community in Changepoints and Non-Stationary Time Series. From 2015-2019 I was also founding Co-Director of Lancaster University's Data Science Institute, a cross-disciplinary community of over 200 academics. I am an elected member of the Learned Society of Wales (2018); have been a member of the Royal Statistical Society's Honours Committee (2019-2024) and currently serve as a member of the Strategic Advisory Team for the Mathematical Sciences theme of the UK's Engineering and Physical Sciences Research Council.

Contextual evidence: Prior to reviewing the thesis produced by Dr Holý, I note from Google Scholar that he has written over 20 peer-reviewed manuscripts and attracted over 280 citations to date. His work appears in a range of well-regarded international journals. It is particularly encouraging to note that several manuscripts published since 2020 have each attracted over 20 citations, underlining both the timeliness and relevance of Dr Holý's research. I also note that the quality of Dr Holý's research has been recognized by the award of a grant by the Czech Science Foundation, of which he is the principal investigator.

Thesis commentary: Dr Holý's thesis provides a wonderful overview of the substantive methodological contributions which he has made to score-driven time series modelling, as well as opening up a range of interesting applications that highlight the work's utility, e.g., in sport statistics and operations research.

The thesis brings together a body of work that clearly represents a considered intellectual view of an exciting new area of research. The preface nicely and succinctly sets out the importance of score-driven models within contemporary time series analysis. The remainder of the thesis then provides an outstanding account of Dr Holý's significant research achievements to date. These comprise 8 papers, each of which is a delight to read. Of these, 6 have been published in international peer-reviewed journals and two are working papers.

I will start by focusing on the two working papers:

Chapter 1 provides a wonderful introduction to the area – thereby laying an important, yet accessible foundation for future researchers. This chapter is no literature review though. Its contribution is far more substantial, documenting an important body of reproducible research in R by Dr Holý. Specifically, the Chapter describes a novel contribution to Generalized autoregressive score (GAS) modelling in the form of a fully documented R package. From my own experience, I am aware of how much time, effort and care is required to produce such code, help files and associated manuscript. The work presented is of a high quality and clearly aimed at a highly regarded journal of open-source software, such as the Journal of Statistical Software. Publication in such journals is non-trivial, due to their substantial impact and visibility. That said, I have every confidence that this manuscript will be accepted in time.

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The other working paper is presented in Chapter 3. This is a very interesting and enjoyable manuscript on the analysis and forecasting of success in Men's Ice Hockey World (Junior) Championships using a dynamic ranking model. This more applied manuscript is again written to a very high standard, demonstrates a very thorough consideration of the modelling challenges and reports the results in balanced and reflective style. Again, I have no doubt that this too will be accepted for publication in a well-regarded journal in time.

This therefore leaves the remaining 6 chapters – each of which has been peer reviewed and published in well-regarded, established international journals. These include manuscripts in

(1) the Journal of the Royal Statistical Soceity (Series C): which introduces an innovative score-driven model designed for dynamic rankings,
(2) the esteemed Annals of Operations Research: introducing a novel approach to modelling high-frequency price time series that can address their various inherent challenges within such data,

together with a further manuscript in Quantitative Finance. That this well-rounded body of research has been peer reviewed, accepted and appeared in print during the period of 2021-2024 is testament to both the quality and dedication of Dr Holý's research, and augers well for early career researchers who will work with, and be trained by Dr Holý in the coming years.

I therefore conclude with my recommendation to the Scientific Council: without hesitation, I commend this Habilitation thesis to you. The work presented within it represents a mature and distinct body of thoughtful research at the interface of methodology and applied statistics. The resulting work is capable of significant real-world impact, not least due to Dr Holý's commitment to making his research accessible to others in the form of a documented, reproducible package.

I look forward to watching Dr Holý's portfolio of research and its influence grow in the coming years.

Yours faithfully,

Idris Eckley,
Distinguished Professor of Statistics

Lancaster University
School of Mathematical Sciences,
Faculty of Science and Technology,
Fylde College,
Lancaster University,
Lancaster, LA1 4YF

T: +44(0)1524 593 960