



**Department of Mathematics and Statistics**  
**Département de mathématiques et de statistique**

Professor Johanna G. Nešlehová, PhD PStat  
805, rue Sherbrooke ouest  
Montréal, QC, Canada H3A 0B9  
+1 514 398 8854  
+1 514 398 3899  
[neslehova@mcgill.ca](mailto:neslehova@mcgill.ca)  
<http://www.math.mcgill.ca/neslehova/>

Professor Jan Trlifaj  
Vice-Dean  
Research and International Affairs Department  
Charles University Prague

Montréal, August 25, 2017

Dear Professor Trlifaj,

At your request, I have assessed the scholarly contributions of Dr. Marek Omelka, who is applying for promotion to the rank of Associate Professor in the Faculty of Mathematics and Physics at Charles University Prague. I hereby confirm that I am not in a conflict of interest position.

Dr. Omelka's habilitation thesis entitled *Nonparametric Estimation of Copulas, Conditional Copulas and Conditional Distribution Functions* is based on five papers. All of them are published in peer-reviewed journals, including in *The Annals of Statistics* and the *Journal of the Royal Society: Series B*, which are the most prestigious publication venues in the statistical sciences worldwide. The habilitation thesis is representative of Dr. Omelka's impressive body of work on empirical processes for copulas and conditional distributions, and the product of his exceptionally fruitful long-term collaboration with Profs. Irène Gijbels and Noël Veraverbeke. The overview is carefully written. It provides the big picture, highlights the theoretical and methodological contributions, and explains their relevance. The habilitation thesis is of excellent quality overall; it is also evident from it that Dr. Omelka has several ideas for future research in this direction.

The first four papers contained in the thesis are concerned with nonparametric estimation of copulas, which characterize the dependence between random variables and as such find numerous applications in biostatistics, econometrics, finance, insurance, hydrology and risk management, among others. Dr. Omelka contributed to this problem by proposing new kernel-based estimators of the copula function (Omelka, Gijbels & Veraverbeke, *The Annals of Statistics*, 2009) as well as estimators of the conditional copula conditionally on a single covariate (Gijbels, Veraverbeke & Omelka, *Computational Statistics & Data Analysis*, 2011; Veraverbeke, Omelka & Gijbels, *Scandinavian Journal of Statistics*, 2011), and of the conditional copula under the assumption that the latter does not depend on the covariate (Gijbels, Omelka & Veraverbeke, *Scandinavian Journal of Statistics*, 2015). The asymptotic behaviour of empirical processes corresponding to these and related estimators is established and proved in full rigour. These are deep results whose derivation requires sophisticated mathematics. They are also the steppingstone to any sound statistical inference that accounts for the fact that data from a copula are not directly observable. Beyond their asymptotic behaviour, the estimators are carefully investigated numerically and special attention is

paid to applications. I particularly liked the idea of the shrinking bandwidth that elegantly resolves the notorious boundary problem.

The fifth paper (Veraverbeke, Gijbels & Omelka, *Journal of the Royal Statistical Society: Series B*, 2014) is also an original contribution of high quality. Here the authors propose and investigate an estimator of a conditional univariate distribution function and propose to pre-adjust it by reducing the effect of the covariate through standardization. This is clever insofar as it can reduce the asymptotic bias, or even removes it entirely when the nonparametric location scale model holds.

Although the training of graduate and postgraduate students is not part of this assessment, I can see that several student projects could easily arise from these five papers alone, such as data analyses and inferential procedures based on the proposed estimators.

Dr. Omelka is a very talented young researcher who has written over 20 peer-reviewed papers, all of which appeared in good venues. He presents his work regularly at international meetings, and contributes to proceedings and festschrifts. Although I do not have access to his CV, it came to my attention that he received a prestigious Simons CRM Scholar visiting position at the *Centre de recherches mathématiques* in Montréal just this year; this is a clear sign of international recognition. He is a rising star in nonparametric statistics and dependence modelling. He has a growing number of collaborators and is busy broadening his expertise in various directions. I also note that he has recent publications with PhD students and colleagues from the Department of Probability and Statistics at Charles University, which makes him a valuable colleague and a dedicated supervisor.

In summary, Dr. Omelka's habilitation thesis and overall research record are excellent. At McGill, tenure is only granted when the research component of an applicant's file is ranked as superior; I have absolutely no doubt that Dr. Omelka would deserve this ranking. I give his promotion my strong support and highly recommend that Dr. Omelka be promoted to the rank of Associate Professor.

Yours truly,

Professor Johanna G. Nešlehová, PhD, PStat