UiO : University of Oslo

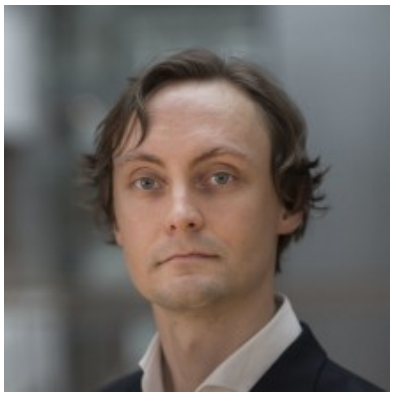
Department of Mathematics
Section of Statistics and Data Science

Seminar Series in Statistics and Data Science

10.11.2020, 14:15 **@ Erling Sverdrups plass, Niels H. Abels hus, 8th floor**
@ Zoom (ID: 610 5725 4729, Passcode: 511014)

Steffen Grønneberg: On robustness in ordinal psychometric models

Abstract: A large part of psychometric data is gathered through questionnaires, with answer options given on an ordinal scale from 1 to 5. Following a framework originating mainly from the tetrachoric correlation of Karl Pearson (1901, Philosophical Transactions of the Royal Society of London), the vector of ordinal answers of a person is seen as discretizations of a continuous random vector, traditionally assumed to be multivariate normal. Standard statistical methods designed for continuous random vectors can then be applied also to ordinal data, such as factor models or structural equation models, by adding in a discretization step to the analysis. As Pearson knew and discussed in his papers, the assumption of underlying normality had to be motivated from knowledge of the underlying phenomena in question. In modern times, influential simulation studies (some of which have several thousand citations) have concluded that standard psychometric tools are robust against moderate deviation from underlying normality. Many practitioners have seen this as a carte blanche for assuming normality without deep knowledge of the variables, and standard practice is to not even assess whether the underlying normality assumption seems to hold. Most previous simulation studies on this topic relied on strictly increasing coordinatewise transformations of a multivariate normal vector to generate non-normal data with a specified covariance matrix. Grønneberg & Foldnes (2019, Psychometrika) points out that when such a vector is discretized, this is equivalent to discretizing exactly normal data with a slightly different covariance matrix than intended, calling into question the interpretation of these simulation studies. Using a non-normal simulation technique from Grønneberg & Foldnes (2017, Psychometrika), we show in Foldnes & Grønneberg (2019, Psychometrika) and Foldnes & Grønneberg (Psychological methods, 2020, forthcoming) that this earlier claimed robustness is dubious, and that a test for underlying normality proposed in Foldnes & Grønneberg (2020, Structural Equation Modeling: A Multidisciplinary Journal) has high power in realistic settings. We also derive some fundamental results on the consistency of various estimation procedures for the correlation matrix of the underlying continuous random variable as the number of categories increases, and show that as long as the marginals are normal, normal theory methods usually work well when the number of categories is 10 or more, which unfortunately is more categories than what is commonly used in practice.



Steffen Grønneberg
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Steffen Grønneberg took a PhD at the University of Oslo in 2011 with Nils Lid Hjort as his supervisor, and has since worked at the BI Norwegian Business School. He received the 2019 Sverdrup prize for young researchers for his work in time series analysis, and has recently been made into a full professor in statistics. He works with psychometrics, time series analysis and large sample theory.

Next seminar

24.11.2020 @ 14:15 **Carla Janaina Ferreira**
DNV GL

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