University of Victoria | Graduate Studies

PROGRAMME

The Final Oral Examination
for the Degree of

DOCTOR OF PHILOSOPHY
(Department of Mathematics & Statistics)

Fan Wu

2008	University of Victoria	MSc (Stats)
2005	University of Western Ontario	BA

"The Extended Empirical Likelihood"

Friday, April, 17, 2015
10:00 AM
Henry Hickman Building 120

Supervisory Committee:
Dr. Min Tsao, Department of Mathematics & Statistics, UVic (Supervisor)
Dr. Mary Lesperance, Department of Mathematics & Statistics, UVic (Member)
Dr. Farouk Nathoo, Department of Mathematics & Statistics, UVic (Member)
Dr. David Giles, Department of Economics, UVic (Outside Member)

External Examiner:
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Chair of Oral Examination:
TBD

Abstract

The empirical likelihood method introduced by Owen (1988, 1990) is a powerful nonparametric method for statistical inference. It has been one of the most researched methods in statistics in the last twenty-five years and remains to be a very active area of research today. There is now a large body of literature on empirical likelihood method which covers its applications in many areas of statistics (Owen, 2001).

One important problem affecting the empirical likelihood method is its poor accuracy, especially for small sample and/or high-dimension applications. The poor accuracy can be alleviated by using high-order empirical likelihood methods such as the Bartlett corrected empirical likelihood but it cannot be completely resolved by high-order asymptotic methods alone. Since the work of Tsao (2004), the impact of the convex hull constraint in the formulation of the empirical likelihood on the finite-sample accuracy has been better understood, and methods have been developed to break this constraint in order to improve the accuracy. Three important methods along this direction are [1] the penalized empirical likelihood of Bartolucci (2007) and Lahiri and Mukhopadhyay (2012), [2] the adjusted empirical likelihood by Chen, Variyath and Abraham (2008), Emerson and Owen (2009), Liu and Chen (2010) and Chen and Huang (2012), and [3] the extended empirical likelihood of Tsao (2013) and Tsao and Wu (2013). The latter is particularly attractive in that it retains not only the asymptotic properties of the original empirical likelihood, but also its important geometric characteristics. In this thesis, we generalize the extended empirical likelihood of Tsao and Wu (2013) to handle inferences in two large classes of one-sample and two-sample problems.

In Chapter 2, we generalize the extended empirical likelihood to handle inference for the large class of parameters defined by one-sample estimating equations, which includes the mean as a special case. In Chapters 3 and 4, we generalize the extended empirical likelihood to handle two-sample problems; in Chapter 3, we study the extended empirical likelihood for the difference between two p-dimensional means; in Chapter 4, we consider the extended empirical likelihood for the difference between two p-dimensional parameters defined by estimating equations. In all cases, we give both the first- and second-order extended empirical likelihood methods and compare these methods with existing methods.

Awards, Scholarships, Fellowships

2011-2015– University Fellowship, *University of Victoria*

Presentations

1. Van Dam-Bates, P., Koch, D., Wu, F. 'Exploitation rates of Atlantic cod (Gadus morhua) off of the coast of Newfoundland. Statistic Society of Canada Annual Meeting, Guelph ON; 4 June, 2012 (Poster presentation)

Publications

1. Tsao, M. and Wu, F. *'Empirical likelihood on the full parameter space." Ann. Statist. **2013**, **41**, 2176–2196.

2. Tsao, M. and Wu, F. *'Extended empirical likelihood for estimating equations." Biometrika **2014**, **101**, 703–710.

3. Wu, F. and Tsao, M. *'Two-sample extended empirical likelihood." Stat Probab Lett **2014**, **84**, 81–87.

4. William J. Reed and Wu, F., *'New Four- and Five-Parameter Models for Income Distributions." Modeling Income Distributions and Lorenz Curves Duangkamon chotikapanich, **Chapter 11**, Springer Science Business Media, LLC, 2008.