

Institute of Mathematical Statistics

LECTURE NOTES — MONOGRAPH SERIES

SHIFTING PARADIGMS IN INFERENCE

C.C. Heyde

Australian National University and Columbia University

Abstract

Some personal perspectives on changing paradigms in inference are presented. The topics discussed include the changes from independence to dependence, estimators to estimating functions and from adhoc methods to Fisher information based methods. Recent trends in time series, general theory of inference, estimating functions and information based techniques are discussed.

1 Introduction

The advent of the new millenium gives us a particularly good excuse to take stock of changing paradigms in inference, or more particularly inference for stochastic processes. Our subject can reasonably be thought of as roughly a century old, and it was strongly practical and model based from the outset. Our distinguished ancestors such as Pyotr En'ko in 1889 with the chain binomial model for epidemics, Louis Bachelier in 1900 with Brownian motion and the modelling of the sharemarket and Filip Lundberg in 1903 with collective risk for insurance application, were very much motivated by the scientific needs of their times.

Any list of paradigms is, of course, rather subjective. The ones that I will treat in this paper are undoubtedly important, and are ones which have influenced me personally. But there are arguably others, and certainly one other that I would have liked to discuss. That is the advent of the computer as a tool for model exploration and simulation. I have learned a lot from the newly available technologies. A lot about bad models, poor behaviour of limit theorems, slow rates of convergence etc. But the constraints of the occasion have precluded discussion of these issues. So let me pass to the topics which I will discuss. These are the changes:

1. Independence \Rightarrow Dependence.
2. Estimators \Rightarrow Estimating Functions.
3. Ad hoc methods \Rightarrow Fisher Information based methods.