

Asymptotics for Associated Random Variables

Bearbeitet von
Paulo Eduardo Oliveira

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Preface

The control of dependence between random variables has always been an object of interest and concern to probabilists and statisticians. Several ways to control this dependence have been introduced, and this book concerns the notion of association of random variables. Association and some other positive dependence notions were introduced in the mid 1960s. The interest on these dependence notions came from models where monotone transformations were concerned. Association and generally positive dependence received little attention of the probabilistic and statistics community, but the interest increased in more recent years. Therefore, a rather complete body of theory was constructed covering the traditional probabilistic topics and, eventually, studying statistics based on dependent samples. Although this increased interest, characterizations and results remained essentially scattered in the literature published in different journals. So, it was time to bring together the bulk of these results, presenting the theory in a unified way, explaining relations and implications of the results. Such a challenge may be taken in, at least, two directions: either going to the more subtle and at the peak of the wave results or introducing the notions from a more elementary approach. In this book this later choice is taken. In this way, the attention of the reader will not be diverted from the essential point, which is the peculiarities of positive dependence and the way to get around the difficulties due this dependence structure. This does not mean that advanced or recent results are not included. On the contrary, the text is organized in a manner such that, starting from this elementary approach, and progression is made towards recent results on the asymptotics of sequences of associated random variables. This book is addressed to researchers in probability and statistics, with a special concern on people interested in kernel estimation methods. It will also be of interest to graduate students in those areas. The book could also be used as a reference on association on a course covering dependent variables and their asymptotics.

After presenting the notion of association of random variables, together with a few variations on this definition, an account of inequalities hold for this dependence structure is given. Many of these inequalities are extended versions of counterparts that are well known for independent random variables, while others are really specific to this dependence. Most of these inequalities were developed as a means to

prove or characterize extension of the classical results to associated variables. These inequalities are presented as a chapter in order to have most of the basic tools available once and for all. The role that the covariance structure plays while controlling asymptotic results for associated random variables will become more explicit. Again, throwing these into a separate chapter would contribute to leave the concentration of the reader directed in the appropriate direction when dealing with the proofs of the later results. With these tools in hand, the text concentrates on the convergence, almost sure or in distribution, and for this later with a special interest on functional results, of sequences of associated random variables. At each of these chapters we include a reference to the asymptotics of kernel estimators based on associated samples.

Writing this book comes a result of work developed through many years during which I had the opportunity to discuss and collaborate with a few colleagues. From these, I would like to leave a special acknowledgement to Pierre Jacob and Charles Suquet for the collaboration, many discussions and friendship throughout the years. Finally, I wish to express my gratitude to my colleague Carlos Tenreiro who helped improving an earlier version of this text.

Coimbra, Portugal

Paulo Eduardo Oliveira

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Oliveira, P.E.

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