Preface

This monograph is a summary of our view of the current state of the art with respect to the analysis of surplus and ruin-theoretic analysis for the class of Sparre Andersen (renewal) insurance risk models. The timing seems appropriate to us, as the analysis of this class of models seems to have reached a plateau. To be more precise, our approach to the analysis uses defective renewal equation methodology in conjunction with ideas promulgated in the seminal paper of Gerber and Shiu (1998), and it appears (at least to us) to be difficult to extend its scope of application in a significant manner at this juncture. We have chosen to focus on an in-depth analysis of standard models as opposed to an exhaustive treatment of models proposed which involve variation of the assumptions inherent in the basic models. Our hope is that the wide variety of ideas and techniques presented here may be adapted to other models as appropriate. In many respects, the material presented here may be viewed as a complement to the monograph by Kyprianou (2013) which focusses primarily on Lévy-based models. The class of Sparre Andersen models differs from the Lévy process models, with one notable exception, namely the classical compound Poisson risk model. This latter model is discussed in detail in Chap. 3, after a preliminary Chap. 2 dealing with various technical ideas which are needed in later chapters. Structural and density concepts which are common to the so-called dependent Sparre Andersen models are presented in Chap. 4. Statistical dependency between the claim amounts and the interclaim time preceding the claim is allowed because the basic underlying random walk structure is unaffected by such dependency, and the usual independent Sparre Andersen model (without such dependency) is typically recoverable easily in any event as a special case. A variety of approaches are employed in a more detailed analysis in Chap. 5 when either the interclaim time or claim size distributions involve Erlang-type components. Chapter 6 discusses the somewhat more technically challenging distribution of the time of ruin in the classical Poisson risk model and includes a discussion of the finite time ruin, which was the subject of the earlier monograph of Seal (1978). Chapter 7 discusses the related delayed and discrete models, and Chap. 8 considers various quantities associated with the time of ruin. Technical analysis in the monograph repeatedly involves solutions of defective renewal equations, and as such, a discussion of bounds on these solutions is then presented. It is worth mentioning that a variety of new results are included in the monograph, in addition to new derivations of results obtained previously in the literature. These notes have been used often in graduate courses at the University of Waterloo and have undergone numerous revisions in recent years in order to streamline the technical treatment of the subject matter. We wish to thank various individuals for their helpful comments and suggestions on the manuscript, which have undoubtedly improved its quality and presentation. These include Eric Cheung, Mirabelle Huynh, David Landriault, Jeff Wong, and Ran Xu. Also, the authors wish to give special thanks to Ms. Joan Hatton for her expert typing of large portions of the manuscript. Finally, we wish to thank our families (Deborah, Rachel, Lauren, and Kristen for GW, and Eric and Bora for JW) for their explicit and implicit support of this project.

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