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Thaleia Zariphopoulou *Editors*

Stochastic Analysis, Filtering, and Stochastic Optimization

A Commemorative Volume to Honor Mark H. A. Davis's Contributions

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Preface

Mark H.A. Davis was an eminent mathematician and so much more. He founded new theories and produced trailblazing results in stochastic analysis and stochastic optimization, and in mathematical finance. This volume is dedicated to his contributions in the first two areas.

Mark was born on April 25, 1945 and studied at Cambridge. He then left for Berkeley and obtained his Ph.D. under Pravin Varaiya in Electrical Engineering. His thesis was on dynamic programming in non-Markovian models, for which he developed a novel approach now known as optional Doob-Meyer decomposition theorem. This result opened up new ways to treat non-Markovian settings and created many new research lines. It initiated the martingale theory for stochastic optimization which became the main approach to study these problems. Much later, these results also influenced considerably the development of the field of mathematical finance.

Mark produced pioneering results in many areas in stochastic analysis and stochastic optimization, beyond the aforementioned martingale theory. It is difficult to list all of them, given the significant breadth and depth of his works. We note his ground-breaking contributions to the general theory of jump processes and the development of the novel pathwise non-linear filtering theory. Mark also developed the theory of piecewise deterministic processes which, besides their core contribution to stochastics, contributed considerably to the analysis of problems in actuarial science. Later on, Mark developed a deterministic approach to stochastic optimization using appropriate Lagrange multipliers. This method later became one of the main approaches to analyze optimization problems in financial mathematics.

Mark authored five books and co-authored six more on stochastic analysis, optimization and finance, and wrote close to two hundred other academic papers. He was Editor-in-Chief of Stochastics and Stochastics Reports (1978–1995), a founding Co-Editor of Mathematical Finance (1990–1993), an Associate Editor of the Annals of Applied Probability (1995–1998), an Associate Editor of Quantitative Finance (2000–2020), and an Associate Editor of the SIAM Journal of Financial Mathematics (2009–2020). He was also a highly influential editorial board member of the book series Springer Finance for 15 years, from 2001 to 2016.

Mark received the Naylor Prize in Applied Mathematics by the London Mathematical Society in 2002. He was also elected a Fellow of the Royal Statistical Society, a Fellow of the Institute of Mathematical Statistics, and an Honorary Fellow of the Institute of Actuaries.

Besides his towering academic stature, Mark was very much adored by our academic community. For those of us lucky enough to have known Mark, we will remember him most for his sharp and witty mind, provoking discussions, kindness and generosity, contagious laughter, and above all, old-fashioned academic nobility.

Mark passed away on March 18, 2020, at the age of 74. He had many interests beside academia. He enjoyed playing music and travelling, always accompanied by his beloved wife Jessica.

It is very difficult to capture the magnitude of Marks legacy. This volume honors him with eighteen papers by collaborators of his as well as by other academics whose research was very much influenced by his results. The papers cover a wide array of topics, offering new and survey results in stochastic analysis and stochastic control. We feel very honored to have been given the opportunity to edit this volume and we are so much grateful to all the authors who contributed their work. We are deeply indebted to Jan Obloj for providing us with the bibliography of Mark Davis, and to Jessica Smith-Davis for providing us with Mark's photo and the title page of Mark's dissertation. Finally, we thank Donna Chernyk and the Springer professionals for helping us to finalize the book.

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