Volume II

Wave Mechanics of Risk

A New Paradigm for Actuarial Science

Numerical Recipes

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Second Edition — 2026

Seven Lions Editions

Contents

Preface

The first volume of *Wave Mechanics of Risk* laid out a paradigm: risk is a wave, the catastrophe a shock front, the portfolio a superposition. The argument was deliberately conceptual — a book of intuitions and ideas.

This second volume is its mirror image. Where the first volume argued in prose, this one computes. Where it gestured at a derivation, this one carries it out. Every chapter here bears the same number and title as a chapter in the first volume, and exists to give the reader the mathematics, the statistics, and the fully worked numerical examples that stand behind the intuition.

The reader is assumed to be familiar with the first volume, or to read the two volumes side by side. Each chapter opens with a brief cross-reference to its counterpart and then proceeds rigorously: definitions, derivations, recipes, and worked examples.

The printed book is, by design, only half of the project. The companion website `quantum.abdelkader.site` hosts the Python implementations of every numerical recipe, the datasets used in every worked example, and an interactive application through which a large share of the mathematics and the exercises can be explored, modified, and executed. No source code appears in these pages: the book gives the algorithm in mathematical form, and the website gives the algorithm in running form. The two are meant to be used together.

The spirit is that of *Numerical Recipes*: a working companion the practitioner keeps on the desk, not on the shelf.

Abdelkader Bousabaa
Paris, August 2026

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The first volume of *Wave Mechanics of Risk* laid out a paradigm: risk as a wave, the catastrophe as a shock front, the portfolio as a superposition. This second volume is its mirror image: where the first argued in prose, this one computes.

Chapter by chapter — in strict correspondence with the first volume — it supplies the definitions, the derivations, the numerical recipes and the fully worked examples that stand behind the intuition: the actuarial Schrödinger equation and its spectrum, interference and entanglement of risks, the uncertainty relation, energy-level pricing, wave-based reserving, barrier penetration and reinsurance, portfolio decoherence, and the catastrophe chapters brought to computational form.

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Topics covered

Actuarial Schrödinger equation • Born rule & risk measures • Interference, entanglement & Schmidt decomposition • The actuarial uncertainty relation • Energy-level pricing • Wave-based reserving • Barrier penetration & reinsurance • Portfolio decoherence & the SCR • Cat Nat shock waves, pricing & accumulation • Climate drift • Numerical recipes & worked examples

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