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Nota di contenuto	0 Goals of this Book and Global Overview; Contents; 0.1 What is this Book?; 0.2 Why has this Book Been Written?; 0.3 For Whom is this Book Intended?; 0.4 Why Should I Read this Book?; 0.5 The Structure of this Book; 0.6 What this Book Does Not Cover; 0.7 Contact, Feedback and More Information; Part I The Continuous Theory Of Partial DifferentiaII Equations; 1 An Introduction to Ordinary Differential Equations; 1.1 Introduction and Objectives; 1.2 Two-Point Boundary Value Problem; 1.2.1 Special Kinds of Boundary Condition; 1.3 Linear Boundary Value Problems; 1.4 Initial Value Problems 1.5 Some Special Cases1.6 Summary and Conclusions; 2 An Introduction to Partial Differential Equations; 2.1 Introduction and Objectives; 2.2 Partial Differential Equations; 2.3 Specialisations; 2.3.1 Elliptic Equations; 2.3.2 Free Boundary Value Problems; 2.4 Parabolic Partial Differential Equations; 2.4.1 Special Cases; 2.5 Hyperbolic Equations; 2.5.1 Second-Order Equations; 2.5.2 First-Order Equations; 2.6 Systems of Equations; 2.6.1 Parabolic Systems; 2.6.2 First-Order Hyperbolic Systems; 2.7 Equations Containing Integrals; 2.8 Summary and Conclusions 3 Second-Order Parabolic Differential Equations3.1 Introduction and Objectives; 3.2 Linear Parabolic Equations; 3.3 The Continuous Problem; 3.4 The Maximum Principle for Parabolic Equations; 3.5 A Special Case: One-Factor Generalised Black-Scholes Models; 3.6 Fundamental Solution and the Green's Function; 3.7 Integral Representation of the Solution of Parabolic PDEs; 3.8 Parabolic Equations in One Space Dimension; 3.9 Summary and Conclusions; 4 An Introduction to the Heat Equation in One Dimension; 4.1 Introduction and Objectives; 4.2 Motivation and Background 4.3 The Heat Equation and Financial Engineering4.4 The Separation of Variables Technique; 4.4.1 Heat Flow in a Road with Ends Held at Constant Temperature; 4.4.2 Heat Flow in a Rod Whose Ends are at a Specified Variable Temperature; 4.4.3 Heat Flow in an Infinite Rod; 4.4.4 Eigenfunction Expansions; 4.5 Transformation Techniques for the Heat Equation; 4.5.1 Laplace Transform; 4.5.2 Fourier Transform for the Heat Equation; 4.6 Summary and Conclusions; 5 An Introduction to the Method of Characteristics; 5.1 Introduction and Objectives; 5.2 First-Order Hyperbolic Equations; 5.2.1 An Example 5.3 Second-Order Hyperbolic Equations5.3.1 Numerical Integration Along the Characteristic Lines; 5.4 Applications to Financial Engineering; 5.4.1 Generalisations; 5.5 Systems of Equations; 5.5.1 An Example; 5.6 Propagation of Discontinuities; 5.6.1 Other Problems; 5.7 Summary and Conclusions; Part II FiniteI DifferenceI Methods: The Fundamentals; 6 An Introduction to the Finite Difference Method; 6.1 Introduction and Objectives; 6.2 Fundamentals of Numerical Differentiation; 6.3 Caveat: Accuracy and Round-Off Errors; 6.4 Where are Divided Differences Used in Instrument Pricing? 6.5 Initial Value Problems
Sommario/riassunto	The world of quantitative finance (QF) is one of the fastest growing areas of research and its practical applications to derivatives pricing problem. Since the discovery of the famous Black-Scholes equation in the 1970's we have seen a surge in the number of models for a wide range of products such as plain and exotic options, interest rate derivatives, real options and many others. Gone are the days when it

was possible to price these derivatives analytically. For most problems we must resort to some kind of approximate method. In this book we employ partial differential equations (PDE) to