
The Black–Scholes Model

MAREK CAPIŃSKI

AGH University of Science and Technology, Kraków, Poland

EKKEHARD KOPP

University of Hull, Hull, UK



CAMBRIDGE
UNIVERSITY PRESS

Contents

	<i>Preface</i>	<i>page vii</i>
1	Introduction	1
	1.1 Asset dynamics	1
	1.2 Methods of option pricing	5
2	Strategies and risk-neutral probability	10
	2.1 Finding the risk-neutral probability	10
	2.2 Self-financing strategies	16
	2.3 The No Arbitrage Principle	19
	2.4 Admissible strategies	21
	2.5 Proofs	30
3	Option pricing and hedging	37
	3.1 Martingale representation theorem	38
	3.2 Completeness of the model	47
	3.3 Derivative pricing	51
	3.4 The Black–Scholes PDE	61
	3.5 The Greeks	68
	3.6 Risk and return	73
	3.7 Proofs	74
4	Extensions and applications	79
	4.1 Options on foreign currency	79
	4.2 Structural model of credit risk	87
	4.3 Compound options	90
	4.4 American call options	96
	4.5 Variable coefficients	98
	4.6 Growth optimal portfolios	99
5	Path-dependent options	107
	5.1 Barrier options	107
	5.2 Distribution of the maximum	109
	5.3 Pricing barrier and lookback options	114
	5.4 Asian options	126

6	General models	133
6.1	Two assets	133
6.2	Many assets	145
6.3	Itô formula	147
6.4	Lévy's Theorem	153
6.5	Girsanov Theorem	158
6.6	Applications	163
	<i>Index</i>	168