## Contents

| Preface          |  
|------------------|-------------------|
| **Introduction** |  
| 1.1 Asset dynamics | 1  
| 1.2 Methods of option pricing | 5  
| **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  
| **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  
| **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  
| **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  

---

Page vii
6 General models
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

Index 168