

Contents

<i>Preface</i>	vii
<i>About the Author</i>	ix
<i>Acknowledgements</i>	xi
<i>Note for PhD Students</i>	xix
1 Utility Theory	1
1.1 Risk Aversion and Certainty Equivalent	3
2 Pricing Kernel and Stochastic Discount Factor	5
2.1 Arrow–Debreu State Prices	5
2.1.1 The pricing kernel, ϕ_i	6
2.1.2 Equilibrium model	8
2.2 Cochrane Two-period Consumption Problem	11
2.2.1 Stochastic discount factor	12
2.2.2 Further notation	13
2.2.3 Risk-free rate	13
2.2.4 Risk corrections	15
2.2.5 Idiosyncratic risk does not affect prices	16
2.3 Expected Return-Beta Representation	17

3	Risk Measures	19
3.1	One-period Portfolio Selection	19
3.2	Rothschild and Stiglitz “Strict” Risk Aversion . . .	21
3.2.1	Efficient portfolio	22
3.2.2	Portfolio analysis	23
3.3	Merton’s Risk Measures	26
3.3.1	Properties of Merton’s risk measure b_p . . .	29
3.3.2	Relationship between b_p and conditional expected return $E[Z_p Z_e]$	33
3.3.3	Discussion	35
	Exercises: Capital Market Theory, Risk Measures	38
4	Consumption and Portfolio Selection	39
4.1	Basic Set-up	39
4.2	One Risky and One Risk-Free Asset	41
4.2.1	The Bellman equation	41
4.2.2	Infinite time horizon	44
4.3	Constant Relative Risk Aversion	45
4.3.1	Solution for J	47
4.3.2	Solution for C and w	49
4.3.3	Economic interpretation	50
4.4	Constant Absolute Risk Aversion	51
4.4.1	Solve for J	51
4.4.2	Solve for C^* and w^*	53
4.4.3	Economic interpretation	53
4.5	Hyperbolic Absolute Risk Aversion (HARA)	54
4.5.1	Relationship with CRRA and CARA	54
4.5.2	Portfolio choice	55
4.5.3	Solution for J	56
4.5.4	Solve for C^* and w^*	58
4.6	Optimal Rules Under Finite Horizon	59
4.6.1	CRRA with finite horizon	61
4.6.2	CARA with finite horizon	61
	Exercises: Intertemporal Portfolio Section	63

5	Optimum Demand and Mutual Fund Theorem	65
5.1	Asset Dynamics and the Budget Equation	65
5.2	The Equation of Optimality	66
5.3	Optimal Investment Weight and Special Cases . . .	68
5.3.1	No risk-free asset	69
5.3.2	GBM and risk-free rate	71
5.3.3	Economic interpretation	72
5.4	Lognormality and Mutual Fund Theorem	73
5.4.1	“Separation” or “mutual-fund” theorem . .	73
5.4.2	Key assumptions and uniqueness	75
5.4.3	Tobin–Markowitz separation theorem . . .	79
	Exercises: Optimum Demand and Mutual Fund Separation	82
6	Mean–Variance Frontier	83
6.1	Mean–Variance Frontier	83
6.1.1	The Sharpe ratio	85
6.1.2	Calculating the mean–variance frontier . . .	86
6.1.3	Decomposing the mean–variance frontier . .	89
6.1.4	Spanning the frontier	92
6.1.5	Hansen–Jagannathan bounds	93
7	Solving Black–Scholes with Fourier Transform	95
7.1	Option Pricing with Fourier Transform	95
7.1.1	Black–Scholes hedge portfolio	96
7.2	Black–Scholes Fundamental PDE	96
7.2.1	Fourier transform	97
7.2.2	Solution through transform method	98
8	Capital Structure Theory	101
8.1	Objective Function for the Firm	101
8.2	Partial Equilibrium One-period Model	103
8.2.1	Pricing kernel	103
8.2.2	Probability-cum-utility function	105
8.2.3	m assets	105

8.2.4	Introducing the concept of dQ	107
8.2.5	What is $e^{\eta r}$?	107
8.3	Payoff of Risky Debt	108
8.4	Pricing Risky Debt	111
8.4.1	Solving the FPDE	112
8.5	Price of a Warrant	114
8.6	Convertible Bond	116
8.6.1	Reverse convertible	117
8.6.2	Call option enhanced reverse convertible	118
8.6.3	Policy implications	118
8.7	Bankruptcy Cost and Tax Benefit	120
8.7.1	Solution under time invariant	120
8.7.2	Protected debt covenant	121
8.7.3	Optimal capital structure	122
8.8	Deposit Insurance	126
	Exercises: Capital Structure Theory	128
9	General Equilibrium	129
9.1	Firms and Securities	129
9.2	Individuals	130
9.3	Aggregate Demand	131
9.4	Market Portfolio	132
9.5	Security Market Line	134
9.6	Three-fund Separation	135
9.7	Empirical Application of CAPM	136
	Exercises: General Equilibrium	138
10	Discontinuity in Continuous Time	141
10.1	Counting and Marked Point Process	141
10.2	Poisson Process	142
10.3	Constant Jump Size	145
10.3.1	Fundamental PDE with constant jump size	146
10.3.2	Market price of jump risk	149
10.3.3	European call price	150
10.3.4	Immediate ruin	151

10.4	Random Jump Size	152
10.4.1	When J has a lognormal distribution . . .	153
10.5	Intertemporal Portfolio Selection with Jumps . . .	154
10.5.1	Portfolio selection	156
10.5.2	Stock markets systemic and idiosyncratic risk	158
	Exercises: Discontinuity in Continuous Time	160
11	Spanning and Capital Market Theories	163
11.1	Necessary Conditions for Non-trivial Spanning . . .	164
11.2	Efficient Portfolio and Spanning	167
11.3	Market Portfolio Spanning and CAPM	176
11.4	Arbitrage Pricing Theory (APT)	183
11.5	Modigliani–Miller Hypothesis	184
11.6	Comment on Spanning	189
11.7	HARA	190
	Exercises: Spanning & Capital Market Theories	192
	<i>Bibliography</i>	193
	<i>Calculus Notes</i>	195
	<i>Index</i>	203