Contents

1	Pricing and hedging 1									
	1.1	Prima	ary securities and strategies	2						
		1.1.1	Discrete time markets	2						
		1.1.2	Self-financing and predictable portfolios	3						
		1.1.3	Relative portfolio	5						
		1.1.4	Discounted market	6						
	1.2	Arbit	rage and martingale measures	7						
	1.3	9								
		1.3.1	Derivative securities	9						
		1.3.2	Arbitrage pricing	10						
		1.3.3	Hedging	13						
		1.3.4	Put-Call parity	13						
	1.4	Marke	et models	14						
		1.4.1	Binomial model	14						
		1.4.2	Trinomial model	18						
	1.5	On pr	ricing and hedging in incomplete markets	22						
	1.6									
		1.6.1	A particular case	23						
		1.6.2	General case	25						
	1.7	Solved	d problems	28						
2	Por	Portfolio optimization								
	2.1		mization of expected utility	62						
		2.1.1	Strategies with consumption	62						
		2.1.2	Utility functions							
		2.1.3	Expected utility of terminal wealth	67						
		2.1.4	Expected utility from intermediate consumption and	01						
		2.1.1	terminal wealth	70						
	2.2	"Mart	tingale" method							
	۵.2	2.2.1	Complete market: terminal wealth							
		٠.٤٠١	Compress market, terminal wearth	12						

		2.2.2	Incomplete market: terminal wealth				
		2.2.3	Complete market: intermediate consumption 81				
		2.2.4	Complete market: intermediate consumption and				
			terminal wealth 86				
	2.3	Dynan	nic Programming Method 88				
		2.3.1	Recursive algorithm				
		2.3.2	Proof of Theorem 2.32				
	2.4	Logari	thmic utility: examples				
		2.4.1	Terminal utility in the binomial model: MG method 94				
		2.4.2	Terminal utility in the binomial model: DP method 96				
		2.4.3	Terminal utility in the completed trinomial model:				
			MG method				
		2.4.4	Terminal utility in the completed trinomial model:				
		2.1.1	DP method				
		2.4.5	Terminal utility in the standard trinomial model:				
		2.1.0	DP method				
		2.4.6	Intermediate consumption in the binomial model:				
		2.4.0	MG method				
		2.4.7	Intermediate consumption in the binomial model:				
		2.4.1	DP method				
		2.4.8	Intermediate consumption in the completed trinomial				
		2.4.0	model: MG method				
		2.4.9	Optimal consumption in the completed trinomial				
		4.4.9	model: DP method				
		2 / 10	Intermediate consumption in the standard trinomial				
		2.4.10	model: DP method				
	2.5	Colmod	problems				
	2.5	Sorved	problems118				
3	American options						
•	3.1		can derivatives and early exercise strategies 166				
	0.1	3.1.1	Arbitrage pricing				
		3.1.1	Arbitrage price in a complete market				
		3.1.2 $3.1.3$	Optimal exercise strategies				
		3.1.3	Hedging strategies				
	3.2		can and European options				
	$\frac{3.2}{3.3}$		• •				
	ა.ა	3.3.1	l problems				
			Preliminaries				
		3.3.2	Solved problems				
4	Inte	rost r	ates				
-	4.1		and interest rates				
	4.1		et models for interest rates				
	$\frac{4.2}{4.3}$		models				
	4.0	4.3.1	Affine models				
		4.3.1 $4.3.2$					
		4.0.2	Discrete time Hull-White model				

4.4	Forwa	rd models
	4.4.1	Binomial forward model
	4.4.2	Multinomial forward model
4.5	Intere	st rate derivatives
	4.5.1	Caps and Floors
	4.5.2	Interest Rate Swaps247
	4.5.3	Swaptions and Swap Rate
4.6	Solved	l problems
	4.6.1	Recalling the basic models
	4.6.2	Options on <i>T</i> -bonds
	4.6.3	Caps and Floors
	4.6.4	Swap Rates and Payer Forward Swaps
	4.6.5	Swaptions
Referen	ces	