## **Table of Contents**

1	Introduction						
	1.1	An Introd	uction to Options in Finance	1			
		1.1.1 Em	pirical Finance	Ę			
		1.1.2 Sto	chastic Finance	•			
		1.1.3 Cor	nputational Finance	€			
	1.2	Some Usef	ul Material from Probability Theory	6			
2	Statistical Analysis of Data from the Stock Market						
	2.1		& Scholes Model	12			
	2.2	Logarithm	ic Returns from Stocks	15			
	2.3		wards Normality	19			
	2.4	Heavy-Tail	led and Skewed Logreturns	20			
	2.5	Logreturns	and the Normal Inverse Gaussian Distribution	23			
	2.6	An Alterna	ative to the Black & Scholes Model	28			
	2.7		and Autocorrelation	28			
	2.8	Conclusion	s Regarding the Choice of Stock Price Model	31			
3	An	An Introduction to Stochastic Analysis					
	3.1	The Itô Int	tegral	33			
	3.2	The Itô Fo	rmula	38			
	3.3	Geometric Brownian Motion as the Solution of a Stochastic  Differential Equation					
		Differential Equation					
	3.4	Conditiona	d Expectation and Martingales	46			
4	Pric		edging of Contingent Claims	53			
	4.1	Motivation from One-Period Markets					
	4.2	The Black & Scholes Market and Arbitrage 5					
	4.3		d Hedging of Contingent Claims $X = f(S(T)) \dots$	60			
			ivation of the Black & Scholes Partial Differential				
		4.3.2 Solu	ationtion of the Black & Scholes Partial Differential	60			
			ation	63			
			Black & Scholes Formula for Call Options	65			
			ging of Call Options	67			
		4.3.5 Hed	ging of General Options	70			

37	T-1-1-	٠.	C	
X	Table	OI	-onte	TILS

		4.3.6 Implied Volatility 72			
	4.4 The Girsanov Theorem and Equivalent Martingale Me				
	4.5	Pricing and Hedging of General Contingent Claims 77			
		4.5.1 An Example: a Chooser Option 79			
	4.6	The Markov Property and Pricing of General Contingent			
		Claims			
	4.7	Contingent Claims on Many Underlying Stocks 83			
	4.8	Completeness, Arbitrage and Equivalent Martingale Measures 86			
	4.9	Extensions to Incomplete Markets 88			
		4.9.1 Energy Markets and Incompleteness 91			
5	Numerical Pricing and Hedging of Contingent Claims 99				
ŧ	5.1				
		5.1.1 Pricing and Hedging of Contingent Claims with			
		Payoff of the Form $f(S_T)$			
•		<ul><li>5.1.2 The Accuracy of Monte Carlo Methods</li></ul>			
		Stocks 105			
		5.1.4 Pricing of Path-Dependent Claims			
	5.2	Pricing and Hedging with the Finite Difference Method 112			
A	Sol	utions to Selected Exercises			
Rei	feren	ces			
Ind	ev	161			