

CONTENTS

BOOK I – RISK.....	5
CHAPTER ONE – WHAT IS RISK?.....	6
Price Volatility	7
1. <i>Price Volatility – a first look – Methods 1 and 2.....</i>	9
2. <i>Ramping up sophistication – Method 3.....</i>	11
3. <i>A histogram of volatility distribution – Method 4.....</i>	13
What is Risk?	14
1. <i>How should one think about risk?.....</i>	16
2. <i>Thinking about Risk – From Exposure to Impact.....</i>	16
Estimating Exposure and Impact – Emirates Airline.....	19
1. <i>What is Emirates Airline's Exposure?</i>	20
2. <i>What is the trend for Emirates Exposure?.....</i>	20
3. <i>What is Impact.....</i>	21
4. <i>What is Emirates' risk appetite?.....</i>	23
5. <i>Conclusions from the Emirates example.....</i>	25
Annexure 1 – Building a Histogram in EXCEL.....	28
Annexure 2 – Trailing (Rolling) Correlations and Volatilities	32
1. <i>Rolling volatilities</i>	32
2. <i>Rolling correlations.....</i>	39
CHAPTER TWO – MEASURING RISK.....	42
Exploring Target Accounts	42
1. <i>Target Accounts & management action. Value at Risk and stop loss limits.....</i>	45
Introducing Value at Risk	45
1. <i>What is Value at Risk?.....</i>	47
2. <i>VaR Methods.....</i>	47
3. <i>Caveats, Qualifications, Limitations and Issues</i>	51
4. <i>Risk or Factor Sensitivities.....</i>	53
Calculating Value at Risk – Step by Step Walkthrough.....	54
1. <i>Methodology.....</i>	54
2. <i>VaR Approach Specific Steps.....</i>	59
3. <i>Proof of equivalence: Short cut method versus VCV matrix approaches to Portfolio VaR ..</i>	65
Value at Risk for Bonds	74
1. <i>Calculating Value at Risk (VaR) for Bonds</i>	74
Annexure – Calculating Value at Risk - A study of VaR flavors.....	83
1. <i>Variance Covariance (VCV) Approach.....</i>	84
2. <i>Historical Simulation Approach.....</i>	87
3. <i>Monte Carlo Simulation Approach</i>	89

4. <i>Incremental VaR</i>	90
5. <i>Marginal VaR</i>	93
6. <i>Conditional VaR</i>	94
7. <i>Probability of Shortfall</i>	97
Annexure – Value at Risk Application – Margin Lending Case Study	98
1. <i>Designing a solution</i>	99
Annexure – Probability of Default Modeling using Merton’s Structured Approach	106
1. <i>The valuation of firm equity as a call option on firms assets</i>	106
CHAPTER THREE – STRESS TESTING, BANK REGULATION & RISK	108
Stress Testing	108
1. <i>A Stress Testing Framework</i>	109
Evolution of banking regulation	114
1. <i>The Great Depression and Regulation Q</i>	114
2. <i>Basel I & Amendments to the Capital Accord</i>	115
3. <i>Basel II</i>	115
4. <i>Basel III</i>	120
5. <i>Comprehensive Capital Analysis and Review (CCAR) – The US response</i>	124
Why Doesn't Bank Regulation Work?.....	126
Annexure A – Capital Estimation for Liquidity Risk Management	128
1. <i>Liquidity Reserves: Real or a Mirage</i>	128
2. <i>Estimating Capital for Liquidity Risk: The framework</i>	132
Annexure B – Liquidity Driven Bank Failures & Near Misses	132
1. <i>Case Study: Bear Stearns</i>	132
2. <i>Case Study: Lehman Brothers</i>	137
3. <i>Case Study: American International Group (AIG)</i>	142
CHAPTER FOUR – MANAGING RISKS	147
A Framework for Risk Management.....	147
1. <i>Risk Policy</i>	149
2. <i>Good Data and a First Look at Models</i>	150
3. <i>Models and Tools</i>	152
4. <i>Metrics and Sensitivities</i>	153
5. <i>Limits and Control Process</i>	157
6. <i>Conclusion</i>	163
Setting Limits.....	164
1. <i>Capital Loss and Stop Loss Limits</i>	164
2. <i>Value-at-Risk Limits</i>	167
3. <i>Regulatory Approach Limits</i>	169
4. <i>Other Market Risk Limits</i>	169
5. <i>Credit Risk Limits</i>	170
6. <i>Application to Products</i>	175
7. <i>Setting Limits for Liquidity Risk</i>	176
8. <i>Setting Limits for Interest Rate Risk</i>	178

9. <i>Limit Breach, Exception processing, Action Plan for Trigger Zones</i>	178
Annexure A – Setting Stop Loss Limits.....	180
1. <i>A guide to setting Stop Loss Limits</i>	180
2. <i>Stop Loss limits example & case study</i>	180
3. <i>Setting Stop Loss Limits - limit review triggers and back testing</i>	186
Annexure A - Risk Metrics.....	188
1. <i>Holding Period Return</i>	188
2. <i>Standard Deviation/ Volatility (Vol)/ σ</i>	188
3. <i>Annualized Return</i>	188
4. <i>Annualized Volatility</i>	189
5. <i>Duration</i>	189
6. <i>Convexity</i>	189
7. <i>Sharpe Ratio</i>	190
8. <i>Put Premium</i>	190
9. <i>Beta with respect to market indices</i>	191
10. <i>Treynor Ratio</i>	191
11. <i>Jensen's Alpha</i>	192
12. <i>Correlation coefficient, r</i>	192
13. <i>Portfolio Volatility taking into account Correlations</i>	195
14. <i>Volatility Trend Analysis</i>	195
CHAPTER FIVE – BUILDING RISK SYSTEMS	196
Treasury and Market Risk.....	199
1. <i>The challenge with treasury risk management</i>	200
The Credit Risk Function.....	202
1. <i>What does credit management involve?</i>	202
The Survival of Risk.....	208
Assessment Framework.....	209
1. <i>The risk survival information flow design</i>	210
2. <i>Risk systems for Central Banks</i>	212
BOOK II – MONTE CARLO SIMULATION	215
CHAPTER SIX – MONTE CARLO SIMULATORS IN EXCEL	216
Building Monte Carlo Simulators in EXCEL.....	216
1. <i>Introduction</i>	216
2. <i>What is a Monte Carlo Simulator?</i>	217
3. <i>The process or generator function</i>	218
4. <i>Building your first Monte Carlo (MC) Simulator model</i>	219
5. <i>Extending MC simulation models to Currencies & Commodities</i>	224
6. <i>MC Simulations models – Understanding drift, diffusion and volatility drag</i>	224
7. <i>Linking Monte Carlo Simulation with Binomial Trees and the Black Scholes model</i>	229
8. <i>Simulating Interest rates using CIR and HJM</i>	230
Monte Carlo Simulation using Historical Returns.....	231

Option Pricing using Monte Carlo Simulation	238
1. <i>Terminology</i>	238
2. <i>Option Pricing in EXCEL – Model framework</i>	244
3. <i>Using Monte Carlo simulation to explain Black Scholes Risk Adjusted Probabilities</i>	246
4. <i>Black Scholes – An intuitive derivation of $N(d_2)$</i>	249
5. <i>Pricing a European call option using Monte Carlo simulation</i>	252
Convergence and Variance reduction techniques for option pricing models	257
1. <i>Introduction</i>	257
2. <i>Antithetic Variable Technique & Quasi Random sequences</i>	258
CHAPTER SEVEN – SIMULATION APPLICATIONS	264
Monte Carlo Simulation VaR using Historical Returns	264
1. <i>Monte Carlo Simulation – early days</i>	264
2. <i>Monte Carlo Simulation revisited – Fixing the distribution</i>	264
3. <i>Monte Carlo simulation and historical returns – Calculating Value at Risk (VaR)</i>	265
Monte Carlo Simulation: Fuel Hedging Problem.....	275
1. <i>Case Context & Back Ground</i>	275
2. <i>Simulating Crude Oil Prices</i>	280
3. <i>Linking financial model to the simulation</i>	284
4. <i>Tweaking the model and making it more real</i>	290
5. <i>Jet Fuel Price Shock Estimation</i>	293
6. <i>Shortfall using Monte Carlo Implementation</i>	293
7. <i>Presenting the case to the client</i>	297
Simulating the Interest Rate Term Structure	304
1. <i>CIR interest rate model</i>	304
Forecasting the Monetary Policy Rate Decision for Pakistan	308
1. <i>Process</i>	308
2. <i>Results</i>	310