

Contents

1 Overview	1
1.1 Learning Outcomes	1
1.2 Introduction	1
1.2.1 Brief Comment on Notation	2
1.3 Current Value Concepts	2
1.3.1 Fair Value	2
1.3.2 Value in Use	3
1.3.3 Recoverable Amount	3
1.4 Standards Requiring Current Value	3
1.4.1 PPE and Investment Properties	3
1.4.2 Financial Instruments	4
1.4.3 Employee Stock Options	4
1.4.4 Purchase Price Allocation, Intangibles and Goodwill	5
1.4.5 Impairment	5
1.4.6 Others: Agriculture, Provisions	6
1.5 More on IFRS 13	6
1.5.1 The Fair Value Definition	6
1.5.2 The Fair Value Hierarchy	6
1.6 Valuation Approaches	7
1.6.1 The Market Approach	7
1.6.2 The Income Approach	8
1.6.3 The Cost Approach	8
1.6.4 Other Approaches	8
Reference	9
2 Forwards and Options	11
2.1 Learning Outcomes	11
2.2 Forwards	12
2.2.1 Fair Value of a Forward	12
2.2.2 Estimating the Forward Price	14
2.2.3 Futures	14
2.3 Options	14
2.3.1 Option Types	15

2.4	European Options with No Dividends	16
2.4.1	The Single-Step Binomial	16
2.4.2	Put-Call Parity	19
2.4.3	Multi-step Lattices	20
2.4.4	Solving the Model: General Strategy	21
2.4.5	Cox-Ross-Rubinstein (CRR)	22
2.4.6	The Equal Probabilities Model	25
2.4.7	Trinomial Model	26
2.4.8	Black-Scholes Equation	29
2.5	American Options	29
2.5.1	American Call, No Dividends	30
2.5.2	American Put, No Dividends	30
2.6	Bermuda Options	32
2.7	Dividends During the Option Life	33
2.7.1	European Option with Dividends	33
2.7.2	Put-Call Parity with Dividends	34
2.7.3	Black-Scholes Equation with Dividends	35
2.7.4	American Options with Dividends	36
2.8	Employee Stock Options (ESOs)	37
2.8.1	Features of Employee Stock Options	37
2.8.2	Relevant IFRS 2 Guidance	39
2.8.3	Black-Scholes for ESO Valuation	41
2.8.4	The Hull-White ESO Model	42
2.9	Asian Options: Monte Carlo Simulation	46
2.10	Measuring Volatility	51
2.10.1	Historical Volatility	51
2.10.2	Implied Volatility	57
2.11	Logic Behind the Risk-Neutral Probabilities Approach	57
2.12	Derivation of the Risk-Neutral Probability Formula in the Standard Multi-step Binomial Lattice	59
2.13	Why an American Call (No Dividends) Is Not Exercised Early	60
2.14	C++ Program for a Binomial Model	62
2.15	C++ Program to Perform Monte Carlo Simulation to Value a European-Style Asian Option	64
	Exercises	65
	References	69
3	Government Bonds	71
3.1	Learning Outcomes	71
3.2	Zero-Coupon Bonds	72
3.2.1	Discount Factors	72
3.2.2	Yield to Maturity	73

	3.2.3	Spot and Forward Interest Rates	75
3.3		Coupon Bonds	78
	3.3.1	Coupon Bond Terminology	78
	3.3.2	Valuing a Coupon Bond	79
3.4		Seasoned Bonds	79
	3.4.1	Seasoned Bond Example	80
	3.4.2	Practical Issues with Seasoned Bonds	80
	3.4.3	ICMA and ISDA Conventions	81
	3.4.4	Accrued Interest	84
3.5		Bootstrapping	86
	3.5.1	Bootstrapping Example	87
	3.5.2	Bootstrapping: Practical Issues	88
3.6		The Svensson Model	88
3.7		Lattice Models of the Term Structure	91
	3.7.1	The Black-Derman-Toy Model (BDT)	92
	3.7.2	The Ho-Lee Model (HL)	96
3.8		Covered Interest Rate Parity (CIRP)	100
	3.8.1	Forward Currency Contract	100
	3.8.2	Forward Currency Exchange Rate	100
	3.8.3	Spot Currency Exchange Rate	100
	3.8.4	The CIRP Model	100
		Exercises	101
		References	103
4		Risky Bonds, Floaters and Swaps	105
4.1		Learning Outcomes	106
4.2		Duration	106
4.3		Spreads	107
	4.3.1	Z-Spread	108
	4.3.2	Nominal Spread	109
	4.3.3	Deriving the Spread	110
	4.3.4	Transition Matrices: The Jarrow-Lando-Turnbull Model	111
4.4		Floaters	117
	4.4.1	Conventions with Reference Rates	118
	4.4.2	Discount Margin	119
	4.4.3	Valuation of Floaters	119
4.5		Vanilla Interest Rate Swaps	123
	4.5.1	Replicating Portfolio	123
	4.5.2	Valuation	123
4.6		Convertible Bonds	124
	4.6.1	The Goldman-Sachs Model	125
4.7		Callable and Puttable Bonds	130
	4.7.1	Case B: Benchmark Example—Straight Bond....	131
	4.7.2	Case C: Callable Bond Example	132

	4.7.3	Case P: Puttable Bond Example	133
		Exercises	134
		References	136
5		Business Valuation	137
	5.1	Learning Outcomes	138
	5.2	Introduction	138
		5.2.1 Accountants and Business Valuation	138
		5.2.2 Approaches to Business Valuation	139
	5.3	Ratio-Based Valuation	139
		5.3.1 Equity Valuation Ratios	140
		5.3.2 Enterprise Valuation Ratios	144
		5.3.3 Subjective Judgements in the Ratio-Based Approach	148
	5.4	Discounted Cash Flow (DCF) Models Introduction	149
		5.4.1 Discounting at a Risk-Free Rate vs a Risk-Adjusted Rate	149
	5.5	One-Stage and Multi-stage DCF Models	150
		5.5.1 One-Stage Models	150
		5.5.2 Two-Stage Model	151
		5.5.3 Three-Stage Models	152
		5.5.4 The Fuller-Hsia H-Model	153
		5.5.5 General Multi-stage Model	155
	5.6	Equity Valuation Models Based on DCF	156
		5.6.1 The Dividend Discount Model (DDM)	156
		5.6.2 The Flow-to-Equity (FTE) Model	157
	5.7	DCF Models for Enterprise Valuation	160
		5.7.1 Sum-of-the-Parts Valuation	160
		5.7.2 Cashflows in Enterprise Valuation	163
		5.7.3 The WACC Model	166
		5.7.4 Adjusted Present Value (APV)	170
		5.7.5 Residual Income Valuation	173
		Exercises	174
		References	176
6		Inputs to Business Valuation	177
	6.1	Learning Outcomes	177
	6.2	Timing of Cashflows	178
		6.2.1 Mid-year Convention	178
		6.2.2 Partial-Year Adjustment	178
	6.3	Projecting Financial Statements	179
		6.3.1 Projecting Cashflows Example	180
		6.3.2 Modeling Uncertainty with Monte Carlo Simulation	183
		6.3.3 Cashflows in Foreign Currencies	186
	6.4	Cost of Capital	188

6.5	Risk-Free Rate	188
	6.5.1 The Risk-Free Rate and Currency	189
6.6	Cost of Debt	189
	6.6.1 Level 1: Yield on Traded Bonds	190
	6.6.2 Level 2: Effective Interest Rate on Recently-Issued Debt	190
	6.6.3 Level 2: Spread on Traded Bond of Similar Risk	190
	6.6.4 Level 3: Spread Based on Synthetic Credit Rating	190
6.7	Cost of Equity	190
	6.7.1 The Capital Asset Pricing Model (CAPM)	191
	6.7.2 Regression Beta	192
	6.7.3 Guideline Company Beta	192
	6.7.4 Estimating k_e and $k_{e,U}$	195
	6.7.5 Estimating the Equity Risk Premium (ERP)	196
	6.7.6 Build-Up Method	199
6.8	Choosing Guideline Companies	200
	6.8.1 Industry	200
	6.8.2 Location	201
	6.8.3 Size	201
	6.8.4 Strategy	201
	Exercises	202
	References	203
7	Intangibles Valuation, Purchase Price Allocation (PPA) and Goodwill Impairment	205
7.1	Learning Outcomes	205
7.2	IFRS and Intangibles	206
	7.2.1 Identification Criteria	206
	7.2.2 Recognition Criteria	207
7.3	Valuation Techniques for Intangibles	208
	7.3.1 Relief from Royalty	208
	7.3.2 Replacement Cost: Software	209
	7.3.3 Replacement Cost Example: Assembled Workforce	211
	7.3.4 The With and Without Model	214
	7.3.5 The Multi-period Excess Earnings Model (MPEEM)	215
	7.3.6 Tax Amortization Benefit (TAB)	218
7.4	Lifing	219
	7.4.1 Weibull Curve Estimation: Example	220
	7.4.2 Iowa Curves	227
7.5	Purchase Price Allocation (PPA)	227
	7.5.1 PPA Example	227

	7.5.2	WACC-WARA Comparison	229
7.6		Non-controlling Interest (NCI).....	231
	7.6.1	The Top-Down Approach	231
	7.6.2	The Bottom-Up Approach	234
7.7		Impairment of Goodwill.....	235
	7.7.1	Value in Use (VIU)	237
		Appendix: Deriving the RUL Formula	241
		Exercises	243
		References	248
8	Property		251
8.1		Learning Outcomes	252
8.2		Property Valuation and IFRS	252
	8.2.1	Property Definition	252
	8.2.2	Valuation Requirements in IFRS	252
8.3		Valuing Land: Highest and Best Use	253
	8.3.1	Highest and Best Use.....	253
8.4		Three Valuation Approaches Outlined.....	255
	8.4.1	The Market Approach	255
	8.4.2	The Income Approach.....	256
	8.4.3	The Cost Approach	256
	8.4.4	The Valuation Hierarchy	257
8.5		The Market Approach	257
	8.5.1	Comparable Transactions	257
	8.5.2	Multiple Regression Analysis (MRA).....	262
8.6		The Income Approach	281
	8.6.1	Direct Capitalization	282
	8.6.2	Yield Capitalization	286
8.7		The Cost Approach	290
	8.7.1	Excess Capital	291
	8.7.2	Inutility Penalty	291
	8.7.3	Physical Deterioration.....	292
	8.7.4	Functional Obsolescence.....	292
	8.7.5	Economic Decline	292
	8.7.6	Tax Savings	293
	8.7.7	Summary	293
8.8		Concluding Remarks	293
		Appendix 1: Santa Fe Data	294
		Exercises	297
		References	298
A	C/C++ Programming Tutorial		299
A.1		Introduction	299
A.2		Getting the C/C++ Compiler	300
A.3		Program Format.....	301

	A.3.1	The #include Directive	301
	A.3.2	The Program Body	301
	A.3.3	Comments	302
A.4		Printing Text to the Screen	303
A.5		Variables.....	304
	A.5.1	Assigning Values to Variables	304
A.6		Keyboard Input	305
A.7		Mathematics.....	305
A.8		Conditionals.....	308
A.9		Loops	311
A.10		Arrays	314
A.11		Functions	316
A.12		Advanced Topics.....	318
	A.12.1	The Standard Normal CDF	318
	A.12.2	The Inverse Normal CDF	319
	A.12.3	Rounding.....	321
	A.12.4	Random Numbers	321
	A.12.5	Your Own #include File.....	324
A.13		Learning More	325
B	Financial Math Refresher		327
B.1		Learning Outcomes	327
B.2		Euler's Number	327
B.3		The Exponential Function	328
B.4		Natural Logarithms	328
B.5		Logarithm Arithmetic	329
B.6		APR Interest Rates.....	330
B.7		APR Discount Rates	331
B.8		Continuous Compounding at 100 Percent	331
B.9		Continuous Compounding at 5 Percent.....	332
B.10		Continuous Compounding for t Years	332
B.11		Continuous Discounting for t Years	332
		References	334
Index			335