Quantitative Business Valuation

A Mathematical Approach for Today's Professionals

Second Edition

JAY B. ABRAMS



Contents

List of Tables and Figures Introduction Acknowledgments		xiii
		xxi
		xxvii
PART I	FORECASTING CASH FLOW	1
CHAPTER 1	Cash Flow: A Mathematical Derivation	5
	Introduction	7
	The Mathematical Model	11
	Analysis of the Mathematical Model	25
	Summary	27
	References	27
CHAPTER 2	Forecasting Cash Flow: Mathematics of the Payout Ratio	29
	Introduction	31
	The Mathematics	32
	Forecasting Gross Cash Flow Is Incorrect	43
	Conclusion	44
	References	44
CHAPTER 3	Using Regression Analysis	45
	Introduction	47
	Forecasting Costs and Expenses	48
	Performing Regression Analysis	51
	Use of Regression Statistics to Test the Robustness of the Relationship	52
	Problems with Regression Analysis for Forecasting	
	Costs	63
	Using Regression Analysis to Forecast Sales	64
	Autocorrelation in Time Series Analysis	69

	Application of Regression Analysis to the Guideline Company (GC) Methods	69
	Summary	73
	References	74
APPENDIX 3A	The ANOVA Table (Table A3.1, Rows 28–32)	75
CHAPTER 4	Annuity Discount Factors and the Gordon Model	79
	Introduction	81
	ADF with End-of-Year Cash Flows	83
	Midyear Cash Flows	91
	Starting Periods Other Than Year 1	93
	Periodic Perpetuity Factors (PPFs): Perpetuities for Periodic Cash Flows	101
	ADFs in Loan Mathematics	107
	Relationship of the Gordon Model to the Price/Earnings and Price/Sales Ratios	110
	The Bias in Annual (versus Monthly) Discounting Is Immaterial	113
	Conclusions	119
	References	121
APPENDIX 4A	Mathematical Appendix	123
APPENDIX 4B	Mathematical Appendix: Monthly ADFs	141
PART II	CALCULATING DISCOUNT RATES	145
CHAPTER 5	Discount Rates as a Function of Log Size	149
	Research Included in the First Edition	151
	Table 5.1: Analysis of Historical Stock Returns	152
	Application of the Log Size Model	167
	Discussion of Models and Size Effects	181
	Industry Effects	191
	The Wedge between Public and Private Firm Valuations	192
	Satisfying Revenue Ruling 59-60	196
	Summary and Conclusions	198
	References	199
APPENDIX 5A	Automating Iteration Using Newton's Method	203

APPENDIX 5B	Mathematical Appendix	207
APPENDIX 5C	Abbreviated Review and Use	211
CHAPTER 6	Arithmetic versus Geometric Means: Empirical Evidence and Theoretical Issues	223
	Introduction	225
	Theoretical Superiority of the Arithmetic Mean	223
	Empirical Evidence of the Superiority of the Arithmetic Mean	220
	Indro and Lee Article	227
	References	232
CHAPTER 7	An Iterative Valuation Approach	235
	Introduction	237
	Equity Valuation Method	237
	Invested Capital Approach	243
	Log Size	245
	Summary	245
	References	247
PART III	ADJUSTING FOR CONTROL AND MARKETABILITY	249
CHAPTER 8	Adjusting for Levels of Control and Marketability	253
	Introduction	257
	The Value of Control and Adjusting for Level	
	of Control	257
	Discount for Lack of Marketability (DLOM)	301
	Conclusion	358
	References	359
APPENDIX 8A	Mathematical Appendix	365
PART IV	PUTTING IT ALL TOGETHER	375
CHAPTER 9	Empirical Testing of Abrams's Valuation Theory	377
	Introduction	270
	Table 0.1. Log Size for 1038_1086	2/9
	Table 9.2: Reconciliation to the IRA Database	200 220
	Calculation of DIOM	202
		20/

	Interpretation of the Error	400
	Conclusion	401
	References	401
CHAPTER 10	Measuring Valuation Uncertainty and Error	403
	Introduction	405
	Measuring Valuation Uncertainty	406
	Measuring the Effects of Valuation Error	410
	Summary and Conclusions	422
	Reference	423
PART V	LITIGATION	425
CHAPTER 11	Demonstrating Expert Bias	427
	Introduction	429
	Market Methods	429
	A Balanced DCF Valuation	432
	Summary	434
CHAPTER 12	Lost Inventory and Lost Profits Damage Formulas in Litigation	435
	Introduction	437
	Commentary to Table 12.1: Sample Damage Calculations with $VM = \$95$	438
	Table 12.1B: Lost Profits Formulas Based on EBITDA for Lost Sales on Inventory Never Produced	445
	When Reality May Vary with Our Assumptions	446
	Modification of Formulas for Wholesale	
	and Retail Businesses	447
	Legal Treatment	447
	Summary	448
	Reference	448
PART VI	VALUING ESOPs AND BUYOUTS OF PARTNERS AND	
	SHAREHOLDERS	449
CHAPTER 13	ESOPs: Measuring and Apportioning Dilution	451
	Introduction	453
	Definitions of Dilution	454
	Table 13.1: Calculation of Lifetime ESOP Costs	456
	The Direct Approach	457

	The Iterative Approach	466
	Summary	469
	References	474
APPENDIX 13A	Mathematical Appendix	475
CHAPTER 14	The Trade-off in Selling to an ESOP versus an Outside Buyer	477
	Section 1: Introduction	479
	Section 2: Advantages and Disadvantages of Selling to an ESOP versus a Third Party	480
	Section 3: The Mathematics	481
	Section 4: Sample Calculations in the Tables	486
	Section 5: Conclusion	494
	References	494
CHAPTER 15	Buyouts of Partners and Shareholders	497
	Introduction	499
	Table 15.1: Pre- and Post-Transaction Valuations	499
	Table 15.2: Dilution in FMV as a Result of the Partner Buyout	501
	Sharing the Dilution	503
	Conclusion	506
PART VII	PROBABILISTIC METHODS	507
CHAPTER 16	Valuing Start-Ups	511
	Issues Unique to Start-Ups	513
	Organization of the Chapter	513
	Part 1: First Chicago Approach	514
	Venture Capital Valuation Approach	520
	Part 2: Debt Restructuring Study	521
	Part 3: Exponentially Declining Sales Growth Model	534
	References	536
CHAPTER 17	Monte Carlo Risk Simulation, by Dr. Johnathan Mun	539
	What Is Monte Carlo Risk Simulation?	541
	Comparing Simulation with Traditional Analyses	543
	Running a Monte Carlo Simulation Using Risk Simulator	543
	Using Forecast Charts and Confidence Intervals	554
	Tornado and Sensitivity Tools in Simulation	556
	Sensitivity Analysis	563
	Distributional Fitting: Single Variable and Multiple Variables	567
	Getting the Risk Simulator Software	571

623

CHAPTER 18	Real Options, by Dr. Johnathan Mun	573
	Part 1: Introduction to Real Options	575
	Part 2: Traditional Valuation Approaches	585
	Part 3: Application: Real Options SLS Software	597
Glossary		617
About the Author		621

Index