Contents

List of figures *page* vii
List of tables ix
Preface xi
Acknowledgments xiii

1 Electronic Commerce and Electronic Marketplaces **1**
1.1 Market-Based Coordination 2
1.2 Fixed versus Dynamic Pricing 7
1.3 Advanced Auction Design for Electronic Markets 10
1.4 The Structure of this Book 12

2 Internet Marketplaces – A Technical Perspective **15**
2.1 The Role of Electronic Brokers 15
2.2 Electronic Brokerage Services on the Internet 17
2.3 Software Architectures of Electronic Commerce Applications 20
2.4 Services of an Electronic Broker 27
2.5 OFFER – A Sample Implementation 36
2.6 Technical Challenges and Directions 41

3 The Difficulty of Setting Prices **47**
3.1 Market Structures 47
3.2 Setting Optimal Prices 52
3.3 Towards Dynamic Pricing 61

4 Methods for the Analyses and Design of Electronic Markets **63**
4.1 Equilibrium Theory 63
4.2 Game Theory 65
4.3 Mechanism Design Theory 70
4.4 Experimental Economics 75
4.5 Computational Economics and Simulation 77

5 Automated Negotiations – A Survey of State-of-the-Art Practices **82**
5.1 A Roadmap to Negotiation Situations in Electronic Commerce 83
5.2 One-on-One Bargaining 85
5.3 Multilateral Negotiations 94
5.4 A Critical Review of Game-Theoretical Auction Models 110
5.5 Experimental Analysis of Standard Auction Mechanisms 114
5.6 Towards New Frontiers – Multi-Unit Auctions 118
5.7 Analysis of Online Auctions 131
5.8 Summary 137

6 Experimental Analysis of Multi-Attribute Auctions **139**
6.1 Multi-Attribute Procurement Negotiations 139
6.2 Description of the Analyzed Mechanisms 140
6.3 Research Questions 144
6.4 Trading Financial Derivatives – A Sample Scenario 145
6.5 Implementation of an Electronic Brokerage Service 154
6.6 Results of a Laboratory Experiment 164

7 Economic Models of Multi-Attribute Auctions **175**
7.1 Previous Game-Theoretical Analysis 175
7.2 Comparison of Conventional and Multi-Attribute Auctions 179
7.3 Multi-Unit Extensions 188
7.4 Summary 199

8 Conclusions and Perspectives **201**
8.1 Applicability and Prerequisites 202
8.2 The Role of Decision Support 204

Appendix: Utility Theory and Decision Analysis Techniques **206**
A1 Basic Ideas of Utility Theory 206
A2 Multi-Objective Decision Analysis 215

References 230
Index 246

Figures

1.1	Product attributes and forms of coordination	*page* 4
1.2	Move to electronic markets	6
1.3	Fixed versus dynamic pricing	10
2.1	Screenshot of the Excite ProductFinder	18
2.2	Electronic marketplaces in the supply chain	19
2.3	Diagram depicting a web-based database application	21
2.4	Three-layered mediation architecture	22
2.5	OMG ECDTF reference architecture	26
2.6	Phase model of an electronic market transaction	27
2.7	OMG trader service	31
2.8	Model of a catalog aggregation service	33
2.9	Catalog aggregation using an object trader	37
2.10	Abstract coupling of classes in a UML class diagram	40
2.11	Screenshot of the E-Broker interface	41
3.1	Entry of new firms on a competitive market	50
3.2	Monopoly with a linear demand curve	54
3.3	Producer revenue in the case of price discrimination	59
4.1	A game in extensive form	69
5.1	Graphical representation of negotiation dynamics for each of the two users in the INSPIRE system	90
5.2	A classification of classic auction types	96
5.3	The OptiMark user interface	129
6.1	Auction maker controlled bid mechanism	141
6.2	Multi-attribute auction formats	144
6.3	Profit/loss example diagram of a short call	149
6.4	Bidding process	155
6.5	RFB Document Type Definition	157
6.6	UML class diagram of the electronic brokerage service	158
6.7	Attribute scales	160
6.8	Buyer client	162

6.9 Bidder client 163
6.10 Decision support for bidders 165
6.11 Difference between multi-attribute and single-attribute auctions 169
6.12 Average equilibrium values below the dominant strategy price 170
6.13 Comparison of the winning bids in English and second-score auctions 171
6.14 Efficiency of different auction formats 172
7.1 Equilibrium in a two-attribute auction 177
7.2 Screenshot of the `simdiag` timing diagram bean 181
7.3 Simulation of multi-attribute auctions 182
7.4 Simulation results assuming different scoring functions 183
7.5 Results of the simulation of a financial derivatives market (w_{vola}) 186
7.6 Results of the simulation of a financial derivatives market (w_{mat}) 187
7.7 Auction types where quality is an issue 189
7.8 Shape of utility function where p is utility independent of y 194
7.9 Optimal bid for different quantities and λs 197
7.10 Average score with different economies of scale 198
7.11 Overview of auction mechanisms 199
A1 Indifference map 208
A2 Preference maximization 211
A3 Optimal choice with perfect complements 212
A4 Different shapes for utility functions 213
A5 Example of an additive utility function 220
A6 Hierarchical decomposition 222
A7 Screenshot of PersonaLogic 228

Tables

3.1	Market structures	*page* 48
3.2	Willingness-to-pay	61
4.1	A payoff matrix of a game	66
4.2	A Nash equilibrium	67
4.3	The prisoner's dilemma	68
5.1	Different types of negotiation situations	84
5.2	Strategic equivalence of single-sided auction formats	99
5.3	Matrix for the allocation of goods	124
5.4	Matrix for the allocation of goods with bidder *C* skipped	125
5.5	Types of items sold at 142 online auction sites	133
A1	Pairwise comparison of objectives	223
A2	Example utilities	224