
Contents

| | |
|---|-----------|
| Preface | xi |
| Acknowledgements | xvii |
| List of Algorithmic Statements | xix |
| List of Figures | xxi |
| List of Tables | xxiii |
| | |
| 1. Two Stage Stochastic Linear Programs | 1 |
| 1.1. Examples of Two Stage Stochastic Linear Programs | 3 |
| 1.1.1. Capacity Expansion Planning: CEP1 | 3 |
| 1.1.2. Power Generation Planning: PGP2 | 6 |
| 1.1.3. Air Freight Scheduling: STORM | 10 |
| 1.1.4. Telecommunications Network Planning: SSN | 14 |
| 1.2. Properties of Two Stage Stochastic Linear Programs | 18 |
| 1.3. Characteristics of Example Problems | 24 |
| 1.4. Bibliographical Notes | 27 |
| Appendix: CEP1 and PGP2 Data | 30 |
| References | 32 |
| | |
| 2. Sampling Within Stochastic Linear Programming ... | 35 |
| 2.1. Kelley's Cutting Plane Algorithm | 37 |
| 2.2. Successive Sample Mean Optimization | 39 |
| 2.3. Issues Related to Sample-Based Optimization | 46 |
| 2.4. Bibliographical Notes | 55 |
| Appendix: Data Used in the Illustrative Example | 57 |

| | |
|---|------------|
| References | 60 |
| 3. Foundations of Stochastic Decomposition | 63 |
| 3.1. Stochastic Cutting Plane Method | 64 |
| 3.2. Asymptotic Analysis of the SCP Algorithm | 72 |
| 3.2.1. Preliminaries | 72 |
| 3.2.2. Asymptotic Results for the SCP Method | 74 |
| 3.3. Subproblem Approximation | 81 |
| 3.4. A Basic Stochastic Decomposition Algorithm | 87 |
| 3.5. Bibliographical Notes | 95 |
| References | 97 |
| | |
| 4. Stabilizing Stochastic Decomposition | 99 |
| 4.1. An Algorithm with Incumbent Solutions | 101 |
| 4.2. A Regularized Master Program | 111 |
| 4.3. Bibliographical Notes | 120 |
| Appendix: Proof of Theorem 4.4 | 122 |
| References | 129 |
| | |
| 5. Stopping Rules for Stochastic Decomposition | 131 |
| 5.1. Termination Based on Asymptotic Properties | 133 |
| 5.1.1. Identification of a Convergent Subsequence | 133 |
| 5.1.2. Estimated Objective Value Stability | 136 |
| 5.2. Termination Based on Error Bound Estimates | 139 |
| 5.2.1. Statistical Estimation of Error Bounds | 140 |
| 5.2.2. Error Bound Variability: A Conceptual Procedure .. | 142 |
| 5.2.3. Error Bound Variability: A Bootstrap Procedure ... | 145 |
| 5.3. Termination Based on Optimality Conditions | 152 |
| 5.3.1. Summary of Optimality Conditions | 152 |

| | |
|---|------------|
| 5.3.2. Optimality Tests for the Case With Sampling | 155 |
| 5.4. A Preliminary Test Prior to Termination | 158 |
| 5.5. A Preliminary Comparison of Termination Criteria | 159 |
| 5.6. Bibliographical Notes | 162 |
| References | 164 |
| 6. Guidelines for Computer Implementation | 165 |
| 6.1. Recursive Updates for Cut Formation | 167 |
| 6.2. Cut Formation and Resampling | 174 |
| 6.2.1. Forming Cuts | 174 |
| 6.2.2. Updating Cuts | 176 |
| 6.2.3. Resampling | 178 |
| 6.3. Implementation of Statistical Optimality Tests | 180 |
| 6.4. Bibliographical Notes | 182 |
| References | 183 |
| 7. Illustrative Computational Experiments | 185 |
| 7.1. Test Problem Characteristics | 186 |
| 7.2. Performance Measures | 188 |
| 7.3. Termination Based on Statistical Tests of Optimality ... | 190 |
| 7.4. Regularized Master Program | 194 |
| 7.5. Large Scale Implementation | 204 |
| 7.5.1. STORM | 206 |
| 7.5.2. SSN | 209 |
| 7.6. Bibliographical Notes | 213 |
| References | 214 |
| Glossary | 215 |