Linear Programming Notes VII
Sensitivity Analysis

1   Introduction

When you use a mathematical model to describe reality you must make approximations. The world is more complicated than the kinds of optimization problems that we are able to solve. Linearity assumptions usually are significant approximations. Another important approximation comes because you cannot be sure of the data that you put into the model. Your knowledge of the relevant technology may be imprecise, forcing you to approximate values in A, b, or c. Moreover, information may change. **Sensitivity analysis** is a systematic study of how sensitive (duh) solutions are to (small) changes in the data. The basic idea is to be able to give answers to questions of the form:

1. If the objective function changes, how does the solution change?

2. If resources available change, how does the solution change?

3. If a constraint is added to the problem, how does the solution change?

One approach to these questions is to solve lots of linear programming problems. For example, if you think that the price of your primary output will be between $100 and $120 per unit, you can solve twenty different problems (one for each whole number between $100 and $120).[1] This method would work, but it is inelegant and (for large problems) would involve a large amount of computation time. (In fact, the computation time is cheap, and computing solutions to similar problems is a standard technique for studying sensitivity in practice.) The approach that I will describe in these notes takes full advantage of the structure of LP programming problems and their solution. It turns out that you can often figure out what happens in "nearby" linear programming problems just by thinking and by examining the information provided by the simplex algorithm. In this section, I will describe the sensitivity analysis information provided in Excel computations. I will also try to give an intuition for the results.

2   Intuition and Overview

Throughout these notes you should imagine that you must solve a linear programming problem, but then you want to see how the answer changes if the problem is changed. In every case, the results assume that **only one thing about the problem changes**. That is, in sensitivity analysis you evaluate what happens when only one parameter of the problem changes.

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[1]OK, there are really 21 problems, but who is counting?

Linear Programming Notes Vii Sensitivity Analysis

Daniel F McAuley

Linear Programming Notes Vii Sensitivity Analysis:

Optimization Methods in Operations Research and Systems Analysis K V Mital,1996 The Mathematical Aspects Of Operations Research And Systems Analysis Concerned With Optimization Of Objectives Form The Subject Of This Book In Its Revised Updated And Enlarged Third Edition Discussion On Linear Programming Has Been Expanded And Recast With Greater Emphasis On Duality Theory Sensitivity Analysis Parametric Programming Multiobjective And Goal Programming And Formulation And Solution Of Practical Problems Chapters On Nonlinear Programming Include Integer Programming Kuhn Tucker Theory Separable And Quadratic Programming Dynamic Programming Geometric Programming And Direct Search And Gradient Methods A Chapter On Theory Of Games Is Also Included A Short Note On Karmarkars Projective Algorithm Is Given In The Appendix The Book Keeps In View The Needs Of The Student Taking A Regular Course In Operations Research Or Mathematical Programming And Also Of Research Scholars In Other Disciplines Who Have A Limited Objective Of Learning The Practical Aspects Of Various Optimization Methods To Solve Their Special Problems For The Former Illustrative Solved Examples And Unsolved Examples At The End Of Each Chapter Small Enough To Be Solved By Hand Would Be Of Greater Interest While For He Latter Summaries Of Computational Algorithms For Various Methods Which Would Help Him To Write Computer Programmes To Solve Larger Problems Would Be More Helpful A Few Computer Programmes In Fortran Iv Have Also Been Given In The Appendix **Quantitative Approaches to Distribution Logistics and Supply Chain Management** Andreas Klose,M. Gracia Speranza,Luk N. Van Wassenhove,2012-12-06 Increasing customer needs the globalization of markets and the evolution of e commerce add to the complexity of logistic processes In today s business it is well understood that an effective management of logistic processes is impossible without the use of computer based tools and quantitative methods This book presents in a systematic way quantitative approaches to distribution logistics and supply chain management The main orientation of the book is towards practical problem solving and numerous case studies and practical applications are presented The topics covered include supply chain management revers logistics e commerce facility location and network planning vehicle routing warehousing inventory control Technical Abstract Bulletin ,1965 **Generalized Convexity and Generalized Monotonicity** Nicolas Hadjisavvas,Juan E. Martinez-Legaz,Jean-Paul Penot,2012-12-06 Various generalizations of convex functions have been introduced in areas such as mathematical programming economics management science engineering stochastics and applied sciences for example Such functions preserve one or more properties of convex functions and give rise to models which are more adaptable to real world situations than convex models Similarly generalizations of monotone maps have been studied recently A growing literature of this interdisciplinary field has appeared and a large number of international meetings are entirely devoted or include clusters on generalized convexity and generalized monotonicity The present book contains a selection of refereed papers presented at the 6th International Symposium on Generalized Convexity Monotonicity and aims

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