

An Example of Cycling in the Simplex Method

Harvey J. Greenberg
University of Colorado at Denver
<http://www.cudenver.edu/~hgreenbe/>
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Hoffman[3] gave the first example of cycling in the simplex method, which had 11 variables and 3 equations. A few years later Beale[1] gave one with only 7 variables and 3 equations, which is given below. (Both are described by Dantzig[2].)

x_1	x_2	x_3	x_4	x_5	x_6	x_7	RHS
[1/4]	-60	-1/25	9	1			0
1/2	-90	-1/50	3		1		0
		1				1	1
-3/4	150	-1/50	6	•	•	•	0
↑							
1	-240	-4/25	36	4			0
	[30]	3/50	-15	-2	1		0
		1				1	1
•	-30	-7/50	33	3	•	•	0
↑							
1		[8/25]	-84	-12	8		0
	1	1/500	-1/2	-1/15	1/30		0
		1				1	1
•	•	-2/25	18	1	1	•	0
↑							
25/8		1	-525/2	-75/2	25		0
-1/160	1		[1/40]	1/120	-1/60		0
-25/8			525/2	75/2	-25	1	1
1/4	•	•	-3	-2	3	•	0
↑							
-125/2	10,500	1		[50]	-150		0
-1/4	40		1	1/3	-2/3		0
125/2	-10,500			-50	150	1	1
-1/2	120	•	•	-1	1	•	0
↑							
-5/4	210	1/50		1	-3		0
1/6	-30	-1/150	1		[1/3]		0
		1				1	1
-7/4	330	1/50	•	•	-2	•	0
↑							

Next tableau is same as first.

References

- [1] E.M.L. Beale. Cycling in the Dual Simplex Method. *Naval Research Logistics Quarterly*, 2(4), 1955.
- [2] G.B. Dantzig. *Linear Programming and Extensions*. Princeton University Press, Princeton, NJ, 1963.
- [3] A.J. Hoffman. *Cycling in the Simplex Algorithm*. Report No. 2974, National Bureau of Standards, Gaithersburg, MD, 1953.