Electronic Transactions on Numerical Analysis.
Volume 23, pp. 1-4, 2006.
Copyright © 2006, Kent State University.
ISSN 1068-9613.

ETNA
Kent State University
etna@mcs.kent.edu

A CASE WHERE BALANCING IS HARMFUL*

DAVID S. WATKINS†

Abstract. Balancing is a common preprocessing step for the unsymmetric eigenvalue problem. If a matrix is badly out of scale, balancing can markedly improve the accuracy of the computed eigenvalues. This paper discusses a situation where balancing has the opposite effect. If a matrix that is not out of scale has been transformed to upper Hessenberg form, a subsequent balancing of the Hessenberg matrix will cause the condition numbers of the eigenvalues to be degraded. Consequently the computed eigenvalues will be substantially less accurate than they would have been if the Hessenberg matrix had not been balanced.

Key words. eigenvalues, balancing, condition number, Hessenberg form

AMS subject classifications. 65F15, 15A18

*Received April 13, 2005. Accepted for publication November 29, 2005. Recommended by W. B. Gragg.
†Department of Mathematics, Washington State University, Pullman, Washington 99164-3113 (watkins@math.wsu.edu).