

## BIDIAGONAL DECOMPOSITIONS, MINORS AND APPLICATIONS\*

## A. BARRERAS<sup> $\dagger$ </sup> and J. M. PEÑA<sup> $\dagger$ </sup>

**Abstract.** Matrices, called  $\varepsilon$ -BD matrices, that have a bidiagonal decomposition satisfying some sign constraints are analyzed. The  $\varepsilon$ -BD matrices include all nonsingular totally positive matrices, as well as their matrices opposite in sign and their inverses. The signs of minors of  $\varepsilon$ -BD matrices are analyzed. The zero patterns of  $\varepsilon$ -BD matrices and their triangular factors are studied and applied to prove the backward stability of Gaussian elimination without pivoting for the associated linear systems.

**Key words.** Bidiagonal decomposition, totally positive matrices, Gaussian elimination, backward stability.

**AMS subject classifications.** 15A18, 15A15, 65F05, 65F15.

<sup>\*</sup>Received by the editors on October 15, 2011. Accepted for publication on June 17, 2012. Handling Editor: Ljiljana Cvetkovic.

<sup>&</sup>lt;sup>†</sup>Dept. Applied Mathematics/IUMA, University of Zaragoza, Zaragoza, Spain 50009; email:{albarrer, jmpena}@unizar.es.

Research Partially Supported by the Spanish Research Grant MTM2009-07315, by Gobierno de Aragón and Fondo Social Europeo.