Numerical methods for nonsingular M-matrix solution of a quadratic matrix equation

Abstract: We study the quadratic matrix equation $X^2 - EX - F = 0$, where $E$ is a diagonal matrix and $F$ is a nonsingular M-matrix, which arises in the study of noisy Wiener-Hopf problems for Markov chains. The solution of practical interest is a particular M-matrix solution. The numerical methods for finding the desired M-matrix solution are discussed by transforming the equation into an equation that belongs to a special class of nonsymmetric algebraic Riccati equations. We discuss two different transformations to transform the equation into a nonsymmetric algebraic Riccati equation and illustrate their effectiveness with numerical results.