

THE NUMERICAL SOLUTION OF RICCATI EQUATIONS

Daniel Szyld

Temple University, Department of Mathematics, Philadelphia, United States

e-mail: szyld@temple.edu

Joint work with Marlliny Monsalve and Valeria Simoncini

Abstract

We compare experimentally the two most common approaches for the solution of Riccati equations: variants of Newton's method, and Krylov subspace projection. We conclude that, with the appropriate choice of subspace, the latter is computationally superior. As part of an explanation of why this is so, we prove several results. Consider the projection of a Riccati and a Lyapunov equation (with the same coefficient matrices) onto the same subspace (using a Galerkin approach), and lift the solutions of the projected systems to the larger space. Our new results compare the two solutions and the two residuals, and bound the norm of their difference. We also present a new formula which allows us to compute the norm of the Riccati residual without explicitly computing it.