

## CONVERGENCE ANALYSIS OF AN INEXACT TRUNCATED RQ-ITERATION \*

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**Abstract.** The Truncated RQ-iteration (TRQ) can be used to calculate interior or clustered eigenvalues of a large sparse and/or structured matrix  $A$ . This method requires solving a sequence of linear equations. When these equations can be solved accurately by a direct solver, the convergence of each eigenvalue is quadratic in general and cubic if  $A$  is hermitian. An important question is whether the TRQ iteration will still converge if these equations are approximately solved by a preconditioned iterative solver. If it does converge, how fast is the convergence rate? In this paper, we analyze the convergence of an inexact TRQ iteration in which linear systems are solved iteratively with some error. We show that under some appropriate conditions, the convergence rate of the inexact TRQ is at least linear with a small convergence factor.

**Key words.** Arnoldi method, Lanczos method, eigenvalues, Truncated RQ-iteration.

**AMS subject classifications.** 65F15, 65G05.

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