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CONVERGENCE ANALYSIS OF MINIMIZATION-BASED NOISE LEVEL-FREE PARAMETER CHOICE RULES FOR LINEAR ILL-POSED PROBLEMS*

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Abstract. Minimization-based noise level-free parameter choice rules for the selection of the regularization parameter in linear ill-posed problems are studied. Abstract convergence results for spectral filter regularization operators using a qualitative condition on the (deterministic) data noise are proven. Furthermore, under source conditions on the exact solution, suboptimal convergence rates and, under certain additional regularity conditions, optimal order convergence rates are shown. The abstract results are examined in more detail for several known parameter choice rules: the quasi-optimality rules (both continuous and discrete) and the Hanke-Raus-rules, together with some specific regularization methods: Tikhonov regularization, Landweber iteration, and spectral cutoff.

Key words. regularization, heuristic parameter choice rule, Hanke-Raus rule, quasi-optimality rule, L-curve method

AMS subject classifications. 65J20, 47A52, 65J22

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