

## FREDHOLM STABILITY RESULTS FOR LINEAR COMBINATIONS OF $m$ -POTENT OPERATORS

ZHONGPENG YANG, XIAOXIA FENG, MEIXIANG CHEN,  
CHUNYAN DENG AND J. J. KOLIHA

**Abstract.** We investigate the stability of the nullity, defect and index of linear combinations  $uA + vB$  of generalized quadratic operators, extending in several directions the recent results of Gau, Wang and Wong (*Oper. Matrices* **2** (2008), 193–199), and of commuting scalar  $m$ -potent operators. For the latter case we prove that the nullspaces of  $uA + vB$  themselves are also stable.

*Mathematics subject classification (2010):* 47B48, 47A53, 15A09.

*Keywords and phrases:* Fredholm operator, stability, scalar  $m$ -potent operator, quadratic operator.

### REFERENCES

- [1] J. K. BAKSALARY AND O. M. BAKSALARY, *Nonsingularity of linear combinations of idempotent matrices*, Linear Algebra Appl. **388** (2004), 25–29.
- [2] I. CHALENDAR, E. FRICAINE AND D. TIMOTIN, *A note on the stability of linear combinations of algebraic operators*, Extracta Math. **23** (2008), 43–48.
- [3] C. Y. DENG, *On properties of generalized quadratic operators*, Linear Algebra Appl. **432** (2010), 847–856.
- [4] H.-K. DU, C.-Y. DENG, M. MBEKHTA AND V. MÜLLER, *On spectral properties of linear combinations of idempotents*, Studia Math. **180** (2007), 211–217.
- [5] Y.-T. DUAN, H.-K. DU, *On generalized quadratic operators*, Acta Anal. Funct. Appl. **9** (2007), 12–17.
- [6] H.-L. GAU, C.-J. WANG AND N.-C. WONG, *Invertibility and Fredholmness of linear combinations of quadratic,  $k$ -potent and nilpotent operators*, Oper. Matrices **2** (2008), 193–199.
- [7] H.-L. GAU AND P. Y. WU, *Fredholmness of linear combinations of two idempotents*, Integral Equations Operator Theory **59** (2007), 579–583.
- [8] R. HARTE, *Invertibility and Singularity for Bounded Linear Operators*, Monographs and Textbooks in Pure and Applied Mathematics **109**, Marcel Dekker, New York, 1988.
- [9] J. J. KOLIHA AND V. RAKOČEVIĆ, *Fredholm properties of the difference of orthogonal projections in a Hilbert space*, Integral Equations Operator Theory **52** (2005), 125–134.
- [10] J. J. KOLIHA AND V. RAKOČEVIĆ, *The nullity and rank of linear combinations of idempotent matrices*, Linear Algebra Appl. **418** (2006), 11–14.
- [11] J. J. KOLIHA AND V. RAKOČEVIĆ, *Stability theorems for linear combinations of idempotents*, Integral Equations Operator Theory **58** (2007), 597–601.
- [12] B. N. SADOVSKII, *Limit-compact and condensing operators*, Russian Math. Surveys **27** (1972), 85–155.
- [13] Y. TIAN AND G. P. H. STYAN, *Rank equalities for idempotent matrices with applications*, J. Comp. Appl. Math. **191** (2006), 77–97.
- [14] Z.-P. YANG, L.-H. FU AND M.-X. CHEN, *Invertibility of linear combinations of  $m$ -scalar idempotent matrices* (Chinese), J. Math. Study **43** (2010), 178–184.