

**COMMON SOLUTION TO A SPLIT EQUALITY MONOTONE
VARIATIONAL INCLUSION PROBLEM, A SPLIT EQUALITY
GENERALIZED GENERAL VARIATIONAL-LIKE
INEQUALITY PROBLEM AND A SPLIT EQUALITY FIXED
POINT PROBLEM**

K.R. KAZMI, REHAN ALI AND MOHD FURKAN

Department of Mathematics, Aligarh Muslim University, Aligarh 202002, India
E-mail: krkazmi@gmail.com, rehan08amu@gmail.com, mohdfurkan786@gmail.com

Abstract. This paper deals with a strong convergence theorem for an iterative method for approximating a common solution to a split equality monotone variational inclusion problem, a split equality generalized general variational-like inequality problem and a split equality fixed point problem for quasi-nonexpansive mappings in real Hilbert spaces. Some consequences are derived from the main result. Finally, we give a numerical example to justify the main result. The main result extends and unifies some recent known results in the literature.

Key Words and Phrases: Split equality monotone variational inclusion problem, split equality generalized general variational-like inequality problem, split equality fixed point problem, iterative method.

2010 Mathematics Subject Classification: 47H09, 47J05, 47J25, 49J40.

Acknowledgments. The authors are extremely grateful to three anonymous referees for their valuable comments and suggestions which improved the manuscript.

REFERENCES

- [1] A. Aleyner, S. Reich, *Block iterative algorithms for solving convex feasibility problems in Hilbert and in Banach*, J. Math. Anal. Appl., **343**(2008), 427-435.
- [2] H. Attouch, J. Bolte, P. Redont, A. Soubeyran, *Alternating proximal algorithms for weakly coupled minimization problems, Applications to dynamical games and PDEs*, J. Convex Anal., **15**(2008), 485-506.
- [3] H.H. Bauschke, P.L. Combettes, *Convex Analysis and Monotone Operator Theory in Hilbert Spaces*, Springer, New York, 2011.
- [4] C. Byrne, *Iterative oblique projection onto convex sets and the split feasibility problem*, Inverse Probl., **18**(2002), 441-453.
- [5] C. Byrne, *A unified treatment of some iterative algorithms in signal processing and image reconstruction*, Inverse Probl., **20**(2004), 103-120.
- [6] C. Byrne, Y. Censor, A. Gibali, S. Reich, *Weak and strong convergence of algorithms for the split common null point problem*, J. Nonlinear Convex Anal., **13**(2012), 759-775.
- [7] Y. Censor, T. Elfving, *A multiprojection algorithm using Bregman projections in a product space*, Numer. Algorithms, **8**(1994), 221-239.

- [8] Y. Censor, T. Bortfeld, B. Martin, A. Trofimov, *A unified approach for inversion problems in intensity modulated radiation therapy*, *Physics in Medicine and Biology*, **51**(2006), 2353-2365.
- [9] Y. Censor, A. Gibali, S. Reich, *Algorithms for the split variational inequality problem*, *Numer. Algorithms*, **59**(2)(2012), 301-323.
- [10] P.L. Combettes, *Hilbertian convex feasibility problem: convergence of projection methods*, *Appl. Math. Optim.*, **35**(1997), 311-330.
- [11] Q.L. Dong, S. He, J. Zhao, *Solving the split equality problem without prior knowledge of operator norms*, *Optimization*, **64**(9)(2015), 1887-1906.
- [12] P. Hartman, G. Stampacchia, *On some non-linear elliptic differential-functional equation*, *Acta Mathematica*, **115**(1966), 271-310.
- [13] K.R. Kazmi, S.H. Rizvi, *Iterative approximation of a common solution of a split equilibrium problem, a variational inequality problem and a fixed point problem*, *J. Egyptian Math. Soc.*, **21**(2013), 44-51.
- [14] K.R. Kazmi, S.H. Rizvi, *An iterative method for split variational inclusion problem and fixed point problem for a nonexpansive mapping*, *Optim. Lett.*, **8**(2014), 1113-1124.
- [15] K.R. Kazmi, R. Ali, *Hybrid projection method for a system of unrelated generalized mixed variational-like inequality problems*, to appear in *Georgian Math. J.*, <https://doi.org/10.1515/gmj-2017-0027>.
- [16] Z. Ma, L. Wang, S.-S. Chang, W. Duan, *Convergence theorems for split equality mixed equilibrium problems with applications*, *Fixed Point Theory Appl.*, **2015**, 2015:31, <https://doi.org/10.1186/s13663-015-0281-x>.
- [17] G. Marino, H.K. Xu, *Weak and strong convergence theorems for strict pseudocontractions in Hilbert space*, *J. Math. Anal. Appl.*, **329**(2007), 336-346.
- [18] A. Moudafi, *A note on the split common fixed point problem for quasi-nonexpansive operators*, *Nonlinear Anal.*, **74**(2008), 4083-4087.
- [19] A. Moudafi, *Split monotone variational inclusions*, *J. Optim. Theory Appl.*, **150**(2011), 275-283.
- [20] A. Moudafi, *A relaxed alternating CQ-algorithm for convex feasibility problems*, *Nonlinear Anal.*, **79**(2013), 117-121.
- [21] A. Moudafi, E. Al-Shemas, *Simultaneous iterative methods for split equality problems*, *Trans. Math. Program. Appl.*, **1**(2)(2013), 1-11.
- [22] A. Moudafi, *Alternating CQ-algorithm for convex feasibility and split fixed point problems*, *J. Nonlinear Convex Anal.*, **15**(2014), 809-818.
- [23] M.A. Noor, *General nonlinear mixed variational-like inequalities*, *Optimization*, **37**(1996), 357-367.
- [24] Z. Opial, *Weak convergence of the sequence of successive approximations for nonexpansive mappings*, *Bull. Amer. Math. Soc.*, **73**(1967), 591-597.
- [25] J. Parida, M. Sahoo, A. Kumar, *A variational-like inequality problem*, *Bull. Austral. Math. Soc.*, **39**(1989), 225-231.
- [26] V. Preda, M. Beldiman, A. Batatoresou, *On variational-like inequalities with generalized monotone mappings*, In: *Generalized Convexity and Related Topics*, *Lecture Notes in Economics and Mathematical Systems*, **583**(2006), 415-431.
- [27] B. Qu, N. Xu, *A note on the CQ algorithm for the split feasibility problem*, *Inverse Probl.*, **21**(2005), 1655-1665.
- [28] J.C. Yao, *The Generalized quasi-variational inequality problem with applications*, *J. Math. Anal. Appl.*, **158**(1991), 139-160.
- [29] J. Zhao, *Solving split equality fixed point problem of quasi-nonexpansive mappings without prior knowledge of operator norms*, *Optimization*, **64**(2015), 2619-2630.
- [30] J. Zhao, S. Wang, *Mixed iterative algorithms for the multiple-set split equality common fixed-point problems without prior knowledge of operator norms*, *Optimization*, **65**(2016), 1069-1083.

Received: June 15, 2016; Accepted: January 20, 2017.

