

**Lee, Jung Rye; Park, Choonkil; Shin, Dong Yun; Yun, Sungsik**  
**Set-valued quadratic functional equations.** (English) Zbl 1453.39022  
Result. Math. 72, No. 1-2, 665-677 (2017).

Summary: In this paper, we introduce set-valued quadratic functional equations and prove the Hyers-Ulam stability of the set-valued quadratic functional equations by using the fixed point method.

**MSC:**

- [39B52](#) Functional equations for functions with more general domains and/or ranges Cited in 4 Documents  
[39B82](#) Stability, separation, extension, and related topics for functional equations  
[47H04](#) Set-valued operators  
[47H10](#) Fixed-point theorems

**Keywords:**

Hyers-Ulam stability; set-valued quadratic functional equation; fixed point

**Full Text:** [DOI](#)

**References:**

- [1] Aczel, J., Dhombres, J.: Functional Equations in Several Variables. Cambridge University Press, Cambridge (1989) · [Zbl 0685.39006](#)
- [2] Aoki, T, On the stability of the linear transformation in Banach spaces, J. Math. Soc. Jpn., 2, 64-66, (1950) · [Zbl 0040.35501](#)
- [3] Arrow, KJ; Debreu, G, Existence of an equilibrium for a competitive economy, Econometrica, 22, 265-290, (1954) · [Zbl 0055.38007](#)
- [4] Aubin, J.P., Frankow, H.: Set-valued Analysis. Birkhäuser, Boston (1990)
- [5] Aumann, RJ, Integrals of set-valued functions, J. Math. Anal. Appl., 12, 1-12, (1965) · [Zbl 0163.06301](#)
- [6] Cardinali, T; Nikodem, K; Papalini, F, Some results on stability and characterization of  $SK$ -convexity of set-valued functions, Ann. Polon. Math., 58, 185-192, (1993) · [Zbl 0786.26016](#)
- [7] Cascales, T; Rodrigeuz, J, Birkhoff integral for multi-valued functions, J. Math. Anal. Appl., 297, 540-560, (2004) · [Zbl 1066.46037](#)
- [8] Castaing, C., Valadier, M.: Convex Analysis and Measurable Multifunctions, Lecture Notes in Mathematics, vol. 580. Springer, Berlin (1977) · [Zbl 0346.46038](#)
- [9] Cădariu, L., Radu, V.: Fixed points and the stability of Jensen's functional equation. J. Inequal. Pure Appl. Math. 4(1), Art. No. 4, 7 (2003) · [Zbl 1039.28013](#)
- [10] Cădariu, L; Radu, V, On the stability of the Cauchy functional equation: a fixed point approach, Grazer Math. Ber., 346, 43-52, (2004) · [Zbl 1060.39028](#)
- [11] Cădariu, L., Radu, V.: Fixed point methods for the generalized stability of functional equations in a single variable. Fixed Point Theory Appl. 2008, Art. ID 749392, 15 (2008)
- [12] Cholewa, PW, Remarks on the stability of functional equations, Aequationes Math., 27, 76-86, (1984) · [Zbl 0549.39006](#)
- [13] Czerwik, S, On the stability of the quadratic mapping in normed spaces, Abh. Math. Sem. Univ. Hamburg, 62, 59-64, (1992) · [Zbl 0779.39003](#)
- [14] Debreu, G.: Integration of correspondences. In: Proceedings of Fifth Berkeley Symposium on Mathematical Statistics and Probability, Vol. II, Part I, pp. 351-372 (1966) · [Zbl 0628.39013](#)
- [15] Diaz, J; Margolis, B, A fixed point theorem of the alternative for contractions on a generalized complete metric space, Bull. Am. Math. Soc., 74, 305-309, (1968) · [Zbl 0157.29904](#)
- [16] Gordji, ME; Park, C; Savadkouhi, MB, The stability of a quartic type functional equation with the fixed point alternative, Fixed Point Theory, 11, 265-272, (2010) · [Zbl 1208.39036](#)
- [17] Gordji, ME; Savadkouhi, MB, Stability of a mixed type cubic-quartic functional equation in non-Archimedean spaces, Appl. Math. Lett., 23, 1198-1202, (2010) · [Zbl 1204.39028](#)
- [18] Găvruta, P, A generalization of the Hyers-Ulam-Rassias stability of approximately additive mappings, J. Math. Anal. Appl.,

- 184, 431-436, (1994) · [Zbl 0818.46043](#)
- [19] Hess, C.: Set-valued integration and set-valued probability theory: an overview. In: Handbook of Measure Theory, Vols. I, II. North-Holland, Amsterdam (2002) · [Zbl 1022.60011](#)
- [20] Hindenbrand, W.: Core and Equilibria of a Large Economy. Princeton University Press, Princeton (1974)
- [21] Hyers, DH, On the stability of the linear functional equation, Proc. Nat. Acad. Sci. USA, 27, 222-224, (1941) · [Zbl 0061.26403](#)
- [22] Hyers, D.H., Isac, G., Rassias, ThM: Stability of Functional Equations in Several Variables. Birkhäuser, Basel (1998) · [Zbl 0907.39025](#)
- [23] Inoan, D., Popa, D.: On selections of generalized convex set-valued maps. Aequationes Math.  $\text{\texttt{88}}$ , 267-276 (2014) · [Zbl 1308.54017](#)
- [24] Isac, G; Rassias, TM, On the Hyers-Ulam stability of  $\psi$ -additive mappings, J. Approx. Theory, 72, 131-137, (1993) · [Zbl 0770.41018](#)
- [25] Isac, G; Rassias, TM, Stability of  $\psi$ -additive mappings: applications to nonlinear analysis, Int. J. Math. Math. Sci., 19, 219-228, (1996) · [Zbl 0843.47036](#)
- [26] Khodaei, H, On the stability of additive, quadratic, cubic and quartic set-valued functional equations, Results Math., 68, 1-10, (2015) · [Zbl 1330.39029](#)
- [27] Klein, E., Thompson, A.: Theory of Correspondence. Wiley, New York (1984)
- [28] Lee, K.: Stability of functional equations related to set-valued functions (preprint) · [Zbl 0818.46043](#)
- [29] McKenzie, LW, On the existence of general equilibrium for a competitive market, Econometrica, 27, 54-71, (1959) · [Zbl 0095.34302](#)
- [30] Miheţ, D; Radu, V, On the stability of the additive Cauchy functional equation in random normed spaces, J. Math. Anal. Appl., 343, 567-572, (2008) · [Zbl 1139.39040](#)
- [31] Mirzavaziri, M; Moslehian, MS, A fixed point approach to stability of a quadratic equation, Bull. Braz. Math. Soc., 37, 361-376, (2006) · [Zbl 1118.39015](#)
- [32] Nikodem, K, On quadratic set-valued functions, Publ. Math. Debrecen, 30, 297-301, (1984) · [Zbl 0537.39002](#)
- [33] Nikodem, K, On Jensen's functional equation for set-valued functions, Radovi Mat., 3, 23-33, (1987) · [Zbl 0628.39013](#)
- [34] Nikodem, K, Set-valued solutions of the Pexider functional equation, Funkcialaj Ekvacioj, 31, 227-231, (1988) · [Zbl 0698.39007](#)
- [35] Piao, YJ, The existence and uniqueness of additive selection for  $(\alpha, \beta)$ - $\beta$ -type subadditive set-valued maps, J. Northeast Norm. Univ., 41, 38-40, (2009)
- [36] Popa, D, Additive selections of  $(\alpha, \beta)$ -subadditive set-valued maps, Glas. Mat. Ser. III, 36, 11-16, (2001) · [Zbl 1039.28013](#)
- [37] Radu, V, The fixed point alternative and the stability of functional equations, Fixed Point Theory, 4, 91-96, (2003) · [Zbl 1051.39031](#)
- [38] Rassias, TM, On the stability of the linear mapping in Banach spaces, Proc. Am. Math. Soc., 72, 297-300, (1978) · [Zbl 0398.47040](#)
- [39] Ravi, K; Thandapani, E; Senthil Kumar, BV, Solution and stability of a reciprocal type functional equation in several variables, J. Nonlinear Sci. Appl., 7, 18-27, (2014) · [Zbl 1296.39027](#)
- [40] Schin, S; Ki, D; Chang, J; Kim, M, Random stability of quadratic functional equations: a fixed point approach, J. Nonlinear Sci. Appl., 4, 37-49, (2011) · [Zbl 1279.39023](#)
- [41] Shin, D; Park, C; Farhadabadi, S, On the superstability of ternary Jordan  $C^*$ -homomorphisms, J. Comput. Anal. Appl., 16, 964-973, (2014) · [Zbl 1329.39027](#)
- [42] Shin, D; Park, C; Farhadabadi, S, Stability and superstability of  $J^*$ -homomorphisms and  $J^*$ -derivations for a generalized Cauchy-Jensen equation, J. Comput. Anal. Appl., 17, 125-134, (2014) · [Zbl 1297.39038](#)
- [43] Skof, F, Proprietà locali e approssimazione di operatori, Rend. Sem. Mat. Fis. Milano, 53, 113-129, (1983) · [Zbl 0599.39007](#)
- [44] Szczawińska, J, On some equation for set-valued functions, Aequationes Math., 85, 421-428, (2013) · [Zbl 1285.39008](#)
- [45] Ulam, S.M.: Problems in Modern Mathematics, Chapter VI, Science edn. Wiley, New York (1940)
- [46] Wang, Z, Stability of two types of cubic fuzzy set-valued functional equations, Results Math., 70, 1-14, (2016) · [Zbl 1352.39025](#)
- [47] Zaharia, C, On the probabilistic stability of the monomial functional equation, J. Nonlinear Sci. Appl., 6, 51-59, (2013) · [Zbl 1296.39029](#)
- [48] Zolfaghari, S, Approximation of mixed type functional equations in  $p$ -Banach spaces, J. Nonlinear Sci. Appl., 3, 110-122, (2010) · [Zbl 1186.39037](#)

This reference list is based on information provided by the publisher or from digital mathematics libraries. Its items are heuristically matched to zbMATH identifiers and may contain data conversion errors. It attempts to reflect the references listed in the original paper as accurately as possible without claiming the completeness or perfect precision of the matching.