

POSITIVE-ADDITIVE FUNCTIONAL EQUATIONS IN C^* -ALGEBRAS

CHOONKIL PARK*, HASSAN AZADI KENARY** AND SANG OG KIM***

*Department of Mathematics, Research Institute for Natural Sciences
 Hanyang University, Seoul 133-791, Republic of Korea
 E-mail: baak@hanyang.ac.kr

**Department of Mathematics, College of Science
 Yasouj University, Yasouj 75914-353, Iran
 E-mail: azadi@mail.yu.ac.ir

***Department of Mathematics, Hallym University
 Chuncheon 200-702, Republic of Korea
 E-mail: sokim@hallym.ac.kr

Abstract. In this paper, we introduce a positive-additive functional equation in C^* -algebras. Using fixed point methods, we prove the stability of the positive-additive functional equation in C^* -algebras. Moreover, we prove the Hyers-Ulam stability of the positive-additive functional equation in C^* -algebras by the direct method of Hyers and Ulam.

Key Words and Phrases: Hyers-Ulam stability, C^* -algebra, fixed point, positive-additive functional equation.

2010 Mathematics Subject Classification: 46L05, 47H10, 39B52.

Acknowledgement. The first author was supported by Basic Science Research Program through the National Research Foundation of Korea funded by the Ministry of Education, Science and Technology (NRF-2009-0070788).

REFERENCES

- [1] T. Aoki, *On the stability of the linear transformation in Banach spaces*, J. Math. Soc. Japan, **2**(1950), 64–66.
- [2] J.A. Baker, *The stability of certain functional equations*, Proc. Amer. Math. Soc., **112**(1991), 729–732.
- [3] L. Cădariu and V. Radu, *Fixed points and the stability of Jensen's functional equation*, J. Inequal. Pure Appl. Math., **4**, no. 1, Art. ID 4 (2003).
- [4] L. Cădariu and V. Radu, *On the stability of the Cauchy functional equation: a fixed point approach*, Grazer Math. Ber., **346**(2004), 43–52.
- [5] L. Cădariu and V. Radu, *Fixed point methods for the generalized stability of functional equations in a single variable*, Fixed Point Theory Appl., **2008**, Art. ID 749392 (2008).
- [6] P. Czerwik, *Functional Equations and Inequalities in Several Variables*, World Scientific Publishing Company, New Jersey, Hong Kong, Singapore and London, 2002.
- [7] J. Diaz and B. Margolis, *A fixed point theorem of the alternative for contractions on a generalized complete metric space*, Bull. Amer. Math. Soc., **74**(1968), 305–309.
- [8] J. Dixmier, *C^* -Algebras*, North-Holland Publ. Com., Amsterdam, New York and Oxford, 1977.

- [9] G.L. Forti, *Comments on the core of the direct method for proving Hyers-Ulam stability of functional equations*, J. Math. Anal. Appl., **295**(2004), 127–133.
- [10] G.L. Forti, *Elementary remarks on Ulam-Hyers stability of linear functional equations*, J. Math. Anal. Appl., **328**(2007), 109–118.
- [11] L. Găvruta, *Matkowski contractions and Hyers-Ulam stability*, Bul. St. Univ. Politehnica Timisoara Mat. Fiz., **53**(67)(2008), 32–35.
- [12] P. Găvruta, *A generalization of the Hyers-Ulam-Rassias stability of approximately additive mappings*, J. Math. Anal. Appl., **184**(1994), 431–436.
- [13] P. Găvruta and L. Găvruta, *A new method for the generalized Hyers-Ulam-Rassias stability*, Internat. J. Nonlinear Anal. Appl., **1**(2010), 11–18.
- [14] K.R. Goodearl, *Notes on Real and Complex C^* -Algebras*, Shiva Math. Series IV, Shiva Publ. Limited, Cheshire, England, 1982.
- [15] M.E. Gordji, C. Park, M.B. Savadkouhi, *The stability of a quartic type functional equation with the fixed point alternative*, Fixed Point Theory, **11**(2010), 265–272.
- [16] D.H. Hyers, *On the stability of the linear functional equation*, Proc. Nat. Acad. Sci. U.S.A., **27**(1941), 222–224.
- [17] D.H. Hyers, G. Isac, Th.M. Rassias, *Stability of Functional Equations in Several Variables*, Birkhäuser, Basel, 1998.
- [18] G. Isac, Th.M. Rassias, *Stability of ψ -additive mappings: Applications to nonlinear analysis*, Internat. J. Math. Math. Sci., **19**(1996), 219–228.
- [19] S. Jung, *Hyers-Ulam-Rassias Stability of Functional Equations in Mathematical Analysis*, Hadronic Press Inc., Palm Harbor, Florida, 2001.
- [20] H.A. Kenary, *Hyers-Ulam stability of some functional equations in non-Archimedean and random normed spaces*, (preprint).
- [21] D. Mihet, *The Hyers-Ulam stability for two functional equations in a single variable*, Banach J. Math. Anal. Appl., **2**(2008), 48–52.
- [22] D. Mihet, V. Radu, *On the stability of the additive Cauchy functional equation in random normed spaces*, J. Math. Anal. Appl., **343**(2008), 567–572.
- [23] A.K. Mirmostafae, *Non-Archimedean stability of quadratic equations*, Fixed Point Theory, **11**(2010), 67–75.
- [24] M. Mirzavaziri, M.S. Moslehian, *A fixed point approach to stability of a quadratic equation*, Bull. Braz. Math. Soc., **37**(2006), 361–376.
- [25] C. Park, *Fixed points and Hyers-Ulam-Rassias stability of Cauchy-Jensen functional equations in Banach algebras*, Fixed Point Theory Appl., **2007**, Art. ID 50175 (2007).
- [26] C. Park, *Generalized Hyers-Ulam-Rassias stability of quadratic functional equations: a fixed point approach*, Fixed Point Theory Appl., **2008**, Art. ID 493751 (2008).
- [27] V. Radu, *The fixed point alternative and the stability of functional equations*, Fixed Point Theory, **4**(2003), 91–96.
- [28] J.M. Rassias, *On approximation of approximately linear mappings by linear mappings*, Bull. Sci. Math., **108**(1984), 445–446.
- [29] J.M. Rassias, *On approximation of approximately linear mappings by linear mappings*, J. Funct. Anal., **46**(1982), 126–130.
- [30] J.M. Rassias, *Solution of the Ulam stability problem for quartic mappings*, Glas. Mat. Ser. III, **34**(54)(1999), 243–252.
- [31] Th.M. Rassias, *On the stability of the linear mapping in Banach spaces*, Proc. Amer. Math. Soc., **72**(1978), 297–300.
- [32] I.A. Rus, *Principles and Applications of Fixed Point Theory*, Ed. Dacia, Cluj-Napoca, 1979.
- [33] I.A. Rus, *Remarks on Ulam stability of the operatorial equations*, Fixed Point Theory, **10**(2009), 305–320.
- [34] I.A. Rus, A. Petruşel, G. Petruşel, *Fixed Point Theory*, Cluj University Press, 2008.
- [35] S.M. Ulam, *A Collection of the Mathematical Problems*, Interscience Publ., New York, 1960.

Received: December 14, 2010; Accepted: February 3, 2011.