Requires Authentication Published by De Gruyter November 15, 2023

On Ulam type of stability for stochastic integral equations with Volterra noise

- Sheila A. Bishop and Samuel A. Iyase

From the journal Random Operators and Stochastic Equations
https://doi.org/10.1515/rose-2023-2026

Abstract

This paper concerns the existence, uniqueness and stability of solutions of stochastic Volterra integral equations perturbed by some random processes. The obtained results extend, generalize and enrich the theory of stochastic Volterra integral equations in literature. Lastly, for illustration, we give an example that agrees with the theoretical analysis.

Keywords: Stochastic Volterra process; U-H-R stability; stochastic perturbed term; evolution solutions; contraction mapping theorem
MSC 2020: 34A12; 37L05; 45D05; 47H10; 60H20

Communicated by Vyacheslav L. Girko

Acknowledgements

The authors would like to appreciate the constructive criticism of the anonymous reviewers.

References

[1] M. S. Abdo, A. M. Saeed, H. A. Wahash and S. K. Panchal, On nonlocal problems for fractional integro-differential equation in Banach space, European J. Sci. Res. 151 (2019), 320–334. Search in Google Scholar

[2] A. Ali, K. Shah and D. Baleanu, Ulam stability results to a class of nonlinear implicit boundary value problems of impulsive fractional differential equations, Adv. Difference Equ. 2019 (2019), Paper No. 5. 10.1186/s13662-018-1940-0Search in Google Scholar

[3] S. András and J. J. Kolumbán, On the Ulam Hyers stability of first order differential systems with nonlocal initial conditions, Nonlinear Anal. 82 (2013), 1–11. 10.1016/j.na.2012.12.008Search in Google Scholar

[4] G. Arthi, J. H. Park and H. Y. Jung, Existence and controllability results for second-order impulsive stochastic evolution systems with state-dependent delay, Appl. Math. Comput. 248 (2014), 328–341. 10.1016/j.amc.2014.09.084Search in Google Scholar

[5] P. W. Bates, On some nonlocal evolution equations arising in materials science, Nonlinear Dynamics and Evolution Equations, Fields Inst. Commun. 48, American Mathematical Society, Providence (2006), 13–52. 10.1090/fic/048/02Search in Google Scholar

[6] S. A. Bishop and E. O. Ayoola, Existence and uniqueness of solutions of a class of quantum stochastic evolution equations, J. Math. Extension 15 (2021), no. 2, 1–14. Search in Google Scholar

[7] S. A. Bishop, K. S. Eke and H. I. Okagbue, Advances on asymptotic stability of impulsive stochastic evolution equations, Int. J. Math. Comput. Sci. 16 (2021), no. 1, 99–109. Search in Google Scholar

[8] S. A. Bishop, S. A. Iyase and H. I. Okagbue, Stability of well-posed stochastic evolution equation, Heliyon 5 (2019), no. 11, Article ID e02832. 10.1016/j.heliyon.2019.e02832Search in Google ScholarPubMed PubMed Central

[9] S. A. Bishop and A. C. Nnubia, Stability of nonlocal stochastic Volterra equations, Int. J. Math. Anal. Optim. 7 (2021), no. 2, 48–55. 10.52968/28302767Search in Google Scholar

[10] S. A. Bishop, G. A. Okeke and K. Eke, Mild solutions of evolution quantum stochastic differential equations with nonlocal conditions, Math. Methods Appl. Sci. 43 (2020), no. 10, 6254–6261. 10.1002/mma.6368Search in Google Scholar

[11] L. Byszewski, Theorems about the existence and uniqueness of solutions of a semilinear evolution nonlocal Cauchy problem, J. Math. Anal. Appl. 162 (1991), no. 2, 494–505. 10.1016/0022-247X(91)90164-USearch in Google Scholar

[12] L. P. Castro and A. M. Simões, Hyers–Ulam–Rassias stability of nonlinear integral equations through the Bielecki metric, Math. Methods Appl. Sci. 41 (2018), no. 17, 7367–7383. 10.1002/mma.4857Search in Google Scholar

[13] P. Čoupek and B. Maslowski, Stochastic evolution equations with Volterra noise, Stochastic Process. Appl. 127 (2017), no. 3, 877–900. 10.1016/j.spa.2016.07.003Search in Google Scholar

[14] K. D. Kucche and P. U. Shikhare, Ulam–Hyers stability of integrodifferential equations in Banach spaces via Pachpatte's inequality, Asian-Eur. J. Math. 11 (2018), no. 4, Article ID 1850062. 10.1142/S1793557118500626Search in Google Scholar

[15] K. D. Kucche and P. U. Shikhare, Ulam stabilities for nonlinear Volterra delay integro-differential equations, Int. J. Nonlinear Anal. Appl. 9 (2018), no. 2, 145–159. Search in Google Scholar

[16] K. D. Kucche and P. U. Shikhare, Ulam stabilities via Pachpatte's inequality for Volterra–Fredholm delay integrodifferential equations in Banach spaces, Note Mat. 38 (2018), no. 1, 67–82. Search in Google Scholar

[17] X. Li, W. Jiang and J. Xiang, Existence and Hyers–Ulam stability results for nonlinear fractional systems with coupled nonlocal initial conditions, J. Appl. Math. Comput. 50 (2016), no. 1–2, 493–509. 10.1007/s12190-015-0881-ySearch in Google Scholar

[18] Z. Liu and R. Wang, A note on fractional equations of Volterra type with nonlocal boundary condition, Abstr. Appl. Anal. 2013 (2013), Article ID 432941. 10.1155/2013/432941Search in Google Scholar

[19] R. H. Martin, Jr., Nonlinear Operators and Differential Equations in Banach Spaces, Pure Appl. Math., Wiley-Interscience, New York, 1976. Search in Google Scholar

[20] N. P. N. Ngoc, Ulam–Hyers–Rassias stability of a nonlinear stochastic integral equation of Volterra type, Differ. Equ. Appl. 9 (2017), no. 2, 183–193. 10.7153/dea-09-15Search in Google Scholar

[21] S. K. Ntouyas and P. C. Tsamatos, Global existence for semilinear evolution equations with nonlocal conditions, J. Math. Anal. Appl. 210 (1997), no. 2, 679–687. 10.1006/jmaa.1997.5425Search in Google Scholar

[22] A. Vinodkumar, Existence, uniqueness and stability results of impulsive stochastic semilinear functional differential equations with infinite delays, J. Nonlinear Sci. Appl. 4 (2011), no. 4, 236–246. 10.22436/jnsa.004.04.02Search in Google Scholar

[23] J. A. Walker, Dynamical Systems and Evolution Equations, Math. Concepts Methods Sci. Eng. 20, Plenum, New York, 1980. 10.1007/978-1-4684-1036-5_3Search in Google Scholar

[24] J. Wang, K. Shah and A. Ali, Existence and Hyers–Ulam stability of fractional nonlinear impulsive switched coupled evolution equations, Math. Methods Appl. Sci. 41 (2018), no. 6, 2392–2402. 10.1002/mma.4748Search in Google Scholar

[25] A. Zada, U. Riaz and F. U. Khan, Hyers–Ulam stability of impulsive integral equations, Boll. Unione Mat. Ital. 12 (2019), no. 3, 453–467. 10.1007/s40574-018-0180-2Search in Google Scholar

[26] L. Zhu, Q. Huang and G. Li, Existence and asymptotic properties of solutions of nonlinear multivalued differential inclusions with nonlocal conditions, J. Math. Anal. Appl. 390 (2012), no. 2, 523–534. 10.1016/j.jmaa.2012.01.055Search in Google Scholar

Received: 2022-10-09
Accepted: 2023-06-28
Published Online: 2023-11-15
Published in Print: 2023-12-01

From the journal

Random Operators and Stochastic Equations
Volume 31 Issue 4
Journal and Issue

This issue
All issues

Articles in the same Issue

Existence results for some stochastic functional integrodifferential systems driven by Rosenblatt process
Random differential hyperbolic equations of fractional order in Fréchet spaces
On Ulam type of stability for stochastic integral equations with Volterra noise

Subjects

- Architecture and Design
- Arts
- Asian and Pacific Studies
- Business and Economics
- Chemistry
- Classical and Ancient Near Eastern Studies
- Computer Sciences
- Cultural Studies
- Engineering
- General Interest
- Geosciences
- History
- Industrial Chemistry
- Islamic and Middle Eastern Studies
- Jewish Studies
- Law
- Library and Information Science, Book Studies
- Life Sciences
- Linguistics and Semiotics
- Literary Studies
- Materials Sciences
- Mathematics
- Medicine

- Music
- Pharmacy
- Philosophy
- Physics
- Social Sciences
- Sports and Recreation
- Theology and Religion

Services

- For Journal Authors
- For Book Authors
- For Librarians
- Rights & Permissions

Publications

- Publication types
- Open Access

About

- Contact
- Career
- About De Gruyter
- Partnerships
- Press
- FAQs

Social

- Facebook
- Instagram
- LinkedIn

- X / Twitter
- YouTube

Winner of the OpenAthens
Best Publisher UX Award 2022

- Help/FAQ