Adv. Oper. Theory 4 (2019), no. 2, 406–418
https://doi.org/10.15352/aot.1808-1406
ISSN: 2538-225X (electronic)
https://projecteuclid.org/aot

A DESCRIPTIVE DEFINITION OF THE ITÔ–HENSTOCK INTEGRAL FOR THE OPERATOR-VALUED STOCHASTIC PROCESS

MHELMAR A. LABENDIA[1*] and JAYROLD P. ARCEDE[2]

Communicated by U. C. Ji

Abstract. In this paper, we formulate a version of fundamental theorem for the Itô–Henstock integral of an operator-valued stochastic process with respect to a Hilbert space-valued Wiener process. This theorem will give a descriptive definition of the Itô–Henstock integral for the operator-valued stochastic process.

References

1. T. S. Chew, T. L. Toh, and J. Y. Tay, *The non-uniform Riemann approach to Itô's integral*, Real Anal. Exchange **27** (2002/03), 495–514.
2. G. Da Prato and J. Zabczyk, *Stochastic equations in infinite dimensions*, Cambridge University Press, Cambridge, 1992.
3. L. Gawarecki and V. Mandrekar, *Stochastic differential equations in infinite dimensions with applications to stochastic partial differential equations*, Springer, Berlin, 2011.
4. S. Ghahramani, *Fundamentals of probability with stochastic processes (3rd edn)*, Prentice-Hall, New Jersey, 2005.
5. R. A. Gordon, *The Integrals of Lebesgue, Denjoy, Perron and Henstock*, American Mathematical Society, 1994.
6. R. Henstock, *Lectures on the theory of integration*, World Scientific, Singapore, 1988.
7. J. Kurzweil, *Henstock–Kurzweil Integration: Its relation to topological vector spaces*, Series in Real Analysis, 7. World Scientific Publishing, River Edge, NJ, 2000.

Date: Received: Aug. 14, 2018; Accepted: Sep. 24, 2018.
*Corresponding author .
2010 *Mathematics Subject Classification.* Primary 60H30; Secondary 60H05.
Key words and phrases. Itô–Henstock integral, Q-Wiener process, orthogonal increment property.

8. M. Labendia and J. Benitez, *Convergence theorems for the Itô–Henstock integrable operator-valued stochastic process*, Malaysian J. Math. Sci. (to appear).
9. M. Labendia, E. De Lara-Tuprio, and T. R. Teng, *Itô–Henstock integral and Itô's formula for the operator-valued stochastic process*, Math. Bohem. **143** (2018), 135–160.
10. P. Y. Lee, *Lanzhou lectures on Henstock integration*, World Scientific, Singapore, 1989.
11. P. Y. Lee and R. Výborný, *The integral: An easy approach after Kurzwiel and Henstock*, Cambridge University Press, Cambridge, 2000.
12. T. Y. Lee, *Henstock-Kurzweil integration on Euclidean spaces*, World Scientific, Singapore, 2011.
13. E. J. McShane, *Stochastic integrals and stochastic functional equations*, SIAM J. Appl. Math. **17** (1969), 287–306.
14. T. Mikosch, *Elementary stochastic calculus with finance in view*, World Scientific, Singapore, 1998.
15. Z. R. Pop-Stojanovic, *On McShane's belated stochastic integral*, SIAM J. Appl. Math. **22** (1972), 87–92.
16. C. Prévôt and M. Röckner, *A concise course on stochastic partial differential equations*, Lecture Notes in Mathematics, 1905. Springer, Berlin, 2007.
17. M. Reed and B. Simon, *Methods of modern mathematical physics I: Functional analysis*, Academic Press, London, 1980.
18. M. Riedle, *Cylindrical Wiener processes*, in Séminaire de Probabilités XLIII, 191–214, Lecture Notes in Math., 2006, Springer, Berlin, 2011.
19. T. L. Toh and T. S. Chew, *The Riemann approach to stochastic integration using non-uniform meshes*, J. Math. Anal. Appl. **280** (2003), 133–147.
20. T. L. Toh and T. S. Chew, *On the Henstock-Fubini theorem for multiple stochastic integrals*, Real Anal. Exchange **30** (2004/05), no. 1, 295–310.
21. S. R. S. Varadhan, *Probability theory*, Courant Lecture Notes in Mathematics, 7. New York University, Courant Institute of Mathematical Sciences, New York; American Mathematical Society, Providence, RI, 2001.

[1]Department of Mathematics and Statistics, Mindanao State University - Iligan Institute of technology, 9200 Iligan City, Philippines.
E-mail address: mhelmar.labendia@g.msuiit.edu.ph

[2]Department of Mathematics, Caraga State University, 8600 Butuan City, Philippines.
E-mail address: jparcede@carsu.edu.ph