

A RIEMANN-TYPE DEFINITION OF THE ITÔ INTEGRAL FOR THE OPERATOR-VALUED STOCHASTIC PROCESS

MHELMAR A. LABENDIA

Communicated by U. C. Ji

ABSTRACT. In this paper, we introduce the Itô–McShane integral and show that the classical Itô integral of an operator-valued stochastic process with respect to a Hilbert space-valued Q -Wiener process can be defined, using the Itô–McShane integral.

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. R. A. Gordon, *The integrals of Lebesgue, Denjoy, Perron, and Henstock*, Graduate Studies in Mathematics, 4. American Mathematical Society, Providence, RI, 1994.
5. R. Henstock, *Lectures on the theory of integration*, Series in Real Analysis, 1. World Scientific Publishing Co., Singapore, 1988.
6. J. Kurzweil, *Henstock-Kurzweil integration: its relation to topological vector spaces*, Series in Real Analysis, 7. World Scientific Publishing Co., Inc., River Edge, NJ, 2000.
7. M. Labendia and J. Arcede, *A descriptive definition of the Itô-Henstock integral for the operator-valued stochastic process*, Adv. Oper. Theory **4** (2019), no. 2, 406–418.
8. M. Labendia and J. Benitez, *Convergence theorems for the Itô-Henstock integrable operator-valued stochastic process*, Malays. J. Math. Sci. (to appear).

Copyright 2019 by the Tusi Mathematical Research Group.

Date: Received: Oct. 30, 2018; Accepted: Jan. 9, 2019.

2010 *Mathematics Subject Classification*. Primary 60H30; Secondary 60H05.

Key words and phrases. Itô–McShane integrable, belated McShane integrable, classical Itô integral, Q -Wiener process.

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), 135-1-60.
10. P. Y. Lee, *Lanzhou lectures on Henstock integration*, Series in Real Analysis, 2. World Scientific Publishing Co., Inc., Teaneck, NJ, 1989.
11. P. Y. Lee and R. Výborný, *The integral: An easy approach after Kurzweil and Henstock*, Cambridge University Press, Cambridge, 2000.
12. T. Y. Lee, *Henstock-Kurzweil integration on Euclidean spaces*, Series in Real Analysis, 12. World Scientific Publishing Co. Pte. Ltd., Hackensack, NJ, 2011.
13. E. J. McShane, *Stochastic integrals and stochastic functional equations*, SIAM J. Appl. Math. **17** (1969), 287-306.
14. E. J. McShane, *Stochastic calculus and stochastic models*, Probability and Mathematical Statistics, Vol. 25. Academic Press, New York-London, 1974.
15. M. Z. Min, L. P. Yee, and T. S. Chew, *Absolute integration using vitali covers*, Real Anal. Exchange **18** (1992/93), 409-419.
16. Z. R. Pop-Stojanovic, *On McShane's belated stochastic integral*, SIAM J. Appl. Math. **22** (1972), 87-92.
17. C. Prévôt and M. Röckner, *A concise course on stochastic partial differential equations*, Lecture Notes in Mathematics, 1905. Springer, Berlin, 2007.
18. M. Reed and B. Simon, *Methods of modern mathematical physics. I. Functional analysis*, Second edition. Academic Press, Inc. [Harcourt Brace Jovanovich, Publishers], New York, 1980.
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), 295-310.

DEPARTMENT OF MATHEMATICS AND STATISTICS, MINDANAO STATE UNIVERSITY - ILIGAN INSTITUTE OF TECHNOLOGY, 9200 ILIGAN CITY, PHILIPPINES.

E-mail address: mhelmar.labendia@msuiit.edu.ph