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NECESSARY CONDITIONS OF OPTIMALITY FOR A CLASS OF STOCHASTIC DIFFERENTIAL EQUATIONS ON UMD BANACH SPACES

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Abstract

In this paper we consider stochastic evolution equations on UMD-Banach spaces. In a recent paper we proved existence of optimal controls. Here in this paper we develop necessary conditions of optimality whereby one can construct the optimal controls. For illustration we use these results to treat the LQR problem in sufficient details under two sets of alternative and distinct assumptions.

Keywords: stochastic evolution equations on Banach spaces, existence of solutions, existence of optimal controls, necessary conditions of optimality.

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References

[1] N.U. Ahmed, Semigroup Theory With Applications to systems and Control, Pitman research Notes in Mathematics Series (1991), Vol. 246, Longman scientific and technical, U.K (copublished in U.S by John Wiley & Sons Inc, New York).

[2] N.U. Ahmed, *A class of nonlinear stochastic differential equations on a UMD Banach space and its optimal control*, SIAM J. Control Optim. (SICON), 2018, (submitted).

[3] N.U. Ahmed, *Stochastic differential equations on Banach spaces and their optimal feedback control*, Discuss. Math. Diff. Incl., Control and Optim. **32** (2012) 87–109. doi:10.7151/dmdico.1138

[4] N.U. Ahmed and K.L. Teo, Optimal Control of Distributed Parameter Systems (Elsevier North Holland, New York, Oxford, 1981).

[5] N.U. Ahmed, *Stochastic control on Hilbert space for linear evolution equation with random operator valued coefficients*, SIAM J. Control Optim. **19** (1981) 401–430, doi:10.1137/0319023.

[6] N.U. Ahmed, *A general class of McKean-Vlasov stochastic wvolution wquations driven by Brownian motion and Lévy process and controlled by Lévy measure*, Discuss. Math. Diff. Incl., Control and Optim. **36** (2016) 181–206. doi:10.7151/dmdico.1186

[7] Z. Brzeźniak, *On stochastic convolutions in Banach spaces and applications*, Stochastics and Stochastics Rep. **61** (1997) 245–295. doi:10.1080/17442509708834122.

[8] Z. Brzeźniak and H. Long, A Note on γ-Radonifying and Summing Operators, Stochastic Analysis, Banach Center Publications, Vol. 105 (Institute of Mathematics, Polish Academy of Sciences, Warsaw, 2015).

[9] D.L. Burkholder, *A geometrical characterization of Banach spaces in which martingale differences are unconditional*, Ann. Probab. **9** (1981) 997–1011, doi:10.1214/aop/1176994270.

[10] G. Da Prato and J. Zabczyk, Stochastic equations in Infinite Dimensions (Cambridge University Press, 1992). doi:10.1017/CBO9780511666223.

[11] N. Dunford and J.T. Schwartz, Linear Operators Part 1, General Theory (Inter Science Publishers, Inc., New York, 1958).

[12] Y. Hu and S. Peng, *Adapted solutions of a Backward semilinear stochastic evolution equation*, Stoch. Anal. and Appl. **9** (1991) 445–459. doi:10.1080/07362999108809250.

[13] J.M.A.M. Van Neerven, M.C. Verrar and L. Weis, Stochastic Evolution Equations in UMD Banach Spaces. arXiv:0804.0932v1[math.FA]

[14] J.M.A.M. Van Neerven, γ-Radonifying Operatotrs – A Survey. arXiv:0911.3788v2[math.FA]

[15] L. Tzafriri, *On the type and co-type of Banach spaces*, Israel J. Math. **32** (1979). doi:10.1007/BF02761182.

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