BDSDES WITH POLYNOMIAL COEFFICIENTS

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Abstract: In this paper we study the existence and uniqueness of the $L_\rho^{2p}(R^d; R^1) \times L_\rho^2(R^d; R^d)$ valued solutions of backward doubly stochastic differential equations (BDSDEs) with polynomial growth coefficients using weak convergence, equivalence of norm principle and Wiener-Sobolev compactness arguments. Then we establish a new probabilistic representation of the weak solutions of SPDEs with polynomial growth coefficients through the solutions of the corresponding BDSDEs. This probabilistic representation is then used to prove the existence of stationary solutions of SPDEs on R^d via infinite horizon BDSDEs. The convergence of the solution of a finite horizon BDSDE, when its terminal time tends to infinity, to the solution of the infinite horizon BDSDE is shown to be equivalent to the convergence of the pull-back of the solution of corresponding SPDE to its stationary solution. This way we obtain the stability of the stationary solution naturally. This is a joint work with Qi Zhang.

References

[1] Q. Zhang, H.Z. Zhao (2007). Stationary solutions of SPDEs and infinite horizon BDSDEs, *J. Funct. Anal.* , **252**, 171-219.

[2] Q. Zhang, H.Z. Zhao (2010). Stationary solutions of SPDEs and infinite horizon BDSDEs with non-Lipschitz coefficients, *J. Differ. Equations* , **248**, 953-991.

[3] Q. Zhang, H.Z. Zhao (2013). SPDEs with polynomial growth coefficients and the Malliavin calculus method, *Stochastic Processes and their Applications*, **123**, 2228-2271.