Abstract

We investigate the wellposedness of stochastic differential equations in infinite dimensions, following the variational approach given in Liu and Röckner (Stochastic Partial Differential Equations: An Introduction, Springer, 2015). We look at the existence and uniqueness of (variational) solutions to stochastic differential equations driven by an infinite-dimensional standard cylindrical Wiener process.

The results we prove require some preliminary knowledge on Bochner integrals and probability and martingale theory in infinite-dimensional Banach spaces amongst other results. We will also introduce the stochastic integral with respect to a $Q$-Wiener process and a standard cylindrical Wiener process.

After that, we sketch the setting for the main result: we discuss the Gelfand triple and sketch the general setting of the existence and uniqueness result. We impose conditions on the coefficients of the stochastic differential equation, namely hemicontinuity, boundedness, coercivity and weak monotonicity.

The proof of existence relies on the existence of strong solutions for finite-dimensional SDEs and weak convergence results. The uniqueness follows from an integration-by-parts argument.