A REVIEW LECTURE ON SEMILINEAR STOCHASTIC EVOLUTION EQUATIONS WITH MONOTONE NONLINEARITY

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Let H be a separable Hilbert space. Suppose $(\Omega, \mathcal{F}, \mathcal{F}_t, P)$ is a complete stochastic basis with a right continuous filtration and $\{W_t, t \in \mathbf{R}\}$ is an H-valued cylindrical Brownian motion with respect to $(\Omega, \mathcal{F}, \mathcal{F}_t, P)$. $U(t, s)$ denotes an almost strong evolution operator generated by a family of unbounded closed linear operators on H. Consider the semilinear stochastic integral equation

$$X_t = U(t,0)X_0 + \int_0^t U(t,s) f_s(X_s) ds + \int_0^t U(t,s) g_s(X) dW_s + V_t,$$

where

- f is of monotone type, i.e., $f_t(.) = f(t, \omega, .) : H \to H$ is semimonotone, demicontinuous, uniformly bounded, and for each $x \in H$, $f_t(x)$ is a stochastic process which satisfies certain measurability conditions.
- $g_s(.)$ is a uniformly-Lipschitz predictable functional with values in the space of Hilbert-Schmidt operators on H.
- V_t is a cadlag adapted process with values in H.
- X_0 is a random variable.

We have obtained existence, uniqueness, boundedness of the solution of this equation. We have shown the solution of this equation changes continuously when one or all of X_0, f, g, and V are varied. We have applied this result to find stationary solutions of certain equations, and to study the associated large deviation principles. In this talk we will briefly survey some results and open problems on this area.