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STOCHASTIC CAUCHY PROBLEM INVERSE TO THE CORRECT ONE

Let's H Hilbert space, $A: D(A) \subset H \to H$ – infinitesimal generator of strongly continuous semigroup $S(\cdot)$, $W(t) - Q$ – Wiener process on $H_1 \supset H$ and $H_0 = Q^{1/2}H$, U_0 – H-valued random variable.

Let's consider for the equation

$$dU(t) = (U(t))dt + B(U(t))dW(t), t \in [0, T]$$

initial problem

$$U(0) = U_0 \tag{1}$$

and the problem of finding on $[0, T]$ of the solution by its value at the end of the segment:

$$U(T) = U_1 \in D(A). \tag{2}$$

Enter a new variable $\tau = T - t$ and denote $U(t) = U(T - \tau) = V(t)$ and we arrive at the Cauchy problem of the form

$$dV(t) = A(V(\tau)) - B(V(t)dW(\tau - T)), V(0) = U_1. \tag{3}$$

Let us call problem (2), or, what is the same, problem (3), the inverse problem for (1).

Along with the semigroup $S(t)$, we define a stochastic convolution in the form

$$W_A^{\Phi}(t) = \int_0^t S(t - s)\Phi(s)dW(s)\, , t \in [0, T],$$

where $\Phi - \mathrm{L}_2^0$ – predictable process, and L_2^0 – space of all Hilbert-Schmidt operators from H_0 in H [1].

Theorem. *Let there exists an operator* $(\lambda I - A)^{-1}$ *for at least one* $\lambda \in \mathbb{C}$ *and let there exist a stochastic convolution* $W_A\Phi$ *for some process* $\Psi \in L_2^0$.

For the forward (1) and inverse problems (3) to be correct, it is necessary and sufficient that the conditions are satisfied

$$\|\mathcal{R}^n(\lambda)\| \leq \frac{\mathcal{M}}{(|Re\lambda| - \omega)^n}, |Re\lambda| > \omega.$$

REFERENCES

1. Prato G.D., Zabczyk J. Stochastic Equations in Infinite Dimensions – CUP (2014), 514 pages.