# PERTURBED VOLTERRA EQUATIONS OF CONVOLUTION TYPE

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We consider stochastic perturbed Volterra equation of the form

$$X(t) = X_0 + \int_0^t [a(t-\tau) + (a*k)(t-\tau)]AX(\tau)d\tau$$
$$+ \int_0^t b(t-\tau)X(\tau)d\tau + \sum_{i=1}^{\infty}\int_0^t \Psi_i(\tau)dW_i(\tau),$$

in a separable Hilbert space $H$. In the above $t \geq 0$, $X_0$ is an $H$-valued random variable, $a,\ k,\ b \in L^1_{loc}(\mathbb{R}_+;\mathbb{R})$ are kernel functions and $A$ is a closed unbounded linear operator in $H$ with a dense domain. The noise term in the equation is defined as a series of integrals with respect to independent scalar Wiener processes $W_i$ defined on a probability space $(\Omega, \mathcal{F}, (\mathcal{F}_t)_{t\geq 0}, P)$. The functions $\Psi_i$ are adapted, piecewise uniformly continuous with values in $L^2(\Omega; H)$. The construction of the above stochastic integral is due to Onno van Gaans [1].

We use the resolvent approach to the considered equation. This approach is a generalization of the semigroup approach, which is usually used to differential equations. In the resolvent approach we introduce a family of bounded linear operators in $H$ generated by the operator $A$ and the kernel functions $a$, $k$ and $b$. The existence and approximation results for such operators have been provided by A. Karczewska and C. Lizama [4].

In the presentation we will provide sufficient conditions for the existence of the strong solution to the above perturbed stochastic Volterra equation. Moreover, we will discuss properties of the stochastic convolution corresponding to the equation under consideration. Our results are a generalization of the results obtained by A. Karczewska and C. Lizama in [2, 3] for the stochastic Volterra equations in the case where $k = b = 0$.

Joint work with Anna Karczewska.

## References


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