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Continuity and boundness of stochastic convolutions

We deal with the stochastic convolutions of two types. The first type are the convolutions of the form

$$\int_0^t P(t-s)dX(s), \quad t \geq 0$$

where $P(t), t \geq 0$ is a continuous semigroup of operators in a Hilbert space H and $X(t), t \geq 0$ is a square integrable martingale with values in H .

The second type are convolutions of the form

$$\int_0^t Z(t-s)dX(s), \quad t \geq 0$$

where $Z(t), t \geq 0$ is a real continuous process on R^+ with $Z(0) = 0$ and X is a real square integrable martingale independent of Z . In particular we consider the case in which Z is a deterministic function.

In the both cases we are interested when the convolutions are continuous (or locally bounded) processes. We present some known results as well much more of open questions.