KOLMOGOROV EQUATIONS ON SPACES OF MEASURES ASSOCIATED TO NONLINEAR FILTERING PROCESSES

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Backward Kolmogorov equations are partial differential equations of parabolic type with given final condition. The relation among them and certain stochastic processes has been intensively investigated in both finite and infinite dimensional case.

The aim of this talk is to introduce a class of backward Kolmogorov equations on spaces of probability and positive measures, associated to measure-valued stochastic processes arising in the context of nonlinear filtering. Indeed, in the filtering framework one can formulate two stochastic differential equations, called Zakai and Kushner-Stratonovich equations, that are satisfied by a positive measure and a probability measure-valued process respectively. Thus, one can study the associated backward Kolmogorov equations, that are partial differential equations of parabolic type on the space of measures.

In the literature, the Kolmogorov equations associated to nonlinear filtering processes have been studied assuming that the measure-valued processes admit a density and then by exploiting stochastic calculus techniques in Hilbert spaces. The approach used here differs from that one, since the existence of a density is not assumed and everything is done directly in the context of measures.

In the talk, we will introduce tools that allow us to write the backward Kolmogorov equations on spaces of measures and then present an existence and uniqueness result for classical solutions. If it remains time, we will discuss also a well posedness result for viscosity solutions.

The talk in based on the preprints [1, 2].

References

[1] Martini, M. (2021). *Kolmogorov equations on spaces of measures associated to nonlinear filtering processes*, preprint: arXiv: 2107.11865.

[2] Martini, M. (2022). *Kolmogorov equations on the space of probability measures associated to the nonlinear filtering equation: the viscosity approach*, preprint: arXiv: 2202.11072.

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