ANNEXE 4.6

Stochastic Processes and their Applications
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Irreducible recurrence, ergodicity, and extremality of invariant measures for resolvents

Abstract

We analyze the transience, recurrence, and irreducibility properties of general sub-Markovian resolvents of kernels and their duals, with respect to a fixed sub-invariant measure
. We give a unifying characterization of the invariant functions, revealing the fact that an
-integrable function is harmonic if and only if it is harmonic with respect to the weak dual resolvent. Our approach is based on potential theoretical techniques for resolvents in weak duality. We prove the equivalence between the
-irreducible recurrence of the resolvent and the extremality of
in the set of all invariant measures, and we apply this result to the extremality of Gibbs states. We also show that our results can be applied to non-symmetric Dirichlet forms, in general and in concrete situations. A second application is the extension of the so called Fukushima ergodic theorem for symmetric Dirichlet forms to the case of sub-Markovian resolvents of kernels.

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