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On spectral and statistical analysis of heavy-tailed Kolmogorov Pearson diffusions

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SUMMARY

One dimensional diffusions are the most tractable class of stochastic processes. The self-adjointness of the associated semigroup yields a spectral decomposition due to McKean which has found many useful applications, for example in mathematical finance.

However, on non-compact state spaces, the spectrum of the generator will generally include both a discrete and a continuous part, with the latter starting at a cutoff point related to the nonexistence of stationary moments, and the significance of this complication for statistical estimation is not yet understood.

Motivated by this question, we consider here the problem of parameter estimation for a class of hypergeometric diffusions with heavy-tailed Pearson type invariant distribution of inverse Gamma, Fisher-Snedecor, or Student type, which exhibit the spectral cutoff phenomena.

We propose, in the positive recurrent case, and assuming the existence of second moments, moments based estimators for the parameters (related to the orthogonal polynomials) and prove their consistency and asymptotic normality.

Keywords: Diffusion process, Pearson equation, orthogonal polynomials, Method of moments

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References

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