

Lyapunov “non-typical” behavior for linear cocycles through the lens of semigroup actions

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The foundations of ergodic theory rely on ergodic theorems due to von Neumann, Birkhoff, Kingman, Hopf among others, which ensure that the time averages of a real valued function converge almost everywhere with respect to any invariant measure, and that its average coincides with the space average of the observable function. Among some more sophisticated ergodic theorems, for functions taking values on non-abelian groups, one can find the celebrated Oseledets’ theorem for matrix cocycles. In rough terms, it provides for each invariant measure an almost everywhere defined invariant splitting and Lyapunov exponents, which are the natural extensions of the concept of eigenvectors and eigenvalues in the context of matrix cocycles.

Although there exist a vast literature on the set of “non-typical” points in the Birkhoff ergodic theorem (meaning those for which the Birkhoff averages do not converge) there seem to be few contributions concerning Lyapunov “non-typical” behavior (cf. [1, 3, 4]). In this talk I will report on recent contributions, obtained in [2] concerning the Baire genericity and entropy of the set of points and directions presenting Lyapunov irregular behavior. This problem turns out to be strongly related to semigroup actions generated by continuous maps, acting on a compact metric space, which do not satisfy any kind of specification property.

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References

- [1] A. Furman. *On the multiplicative ergodic theorem for uniquely ergodic systems.* Ann. Inst. Henri Poincaré Probab. Stat. **33** (6) (1997) 797–815.

- [2] G. Ferreira and P. Varandas: *Lyapunov “non-typical” behavior for linear cocycles through the lens of semigroup actions*. Preprint ArXiv.
- [3] X. Tian. *Nonexistence of Lyapunov exponents for matrix cocycles*. Ann. Inst. Henri Poincaré Probab. Stat. **53** (1) (2017) 493–502.
- [4] X. Tian. *Lyapunov “non-typical” points of matrix cocycles and topological entropy*. Preprint arXiv:1505.04345.