

RECURRENCE OF THE CRITICAL MULTI DIMENSIONAL AFFINE PROCESS

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Consider the Markov chain on \mathbb{R}^d defined by the recursion

$$X_n = A_n X_{n-1} + B_n$$

where the $(A_n, B_n) \in M(d) \times \mathbb{R}^d$ is an i.i.d. sequence. This process has been widely studied for both its interest in applied probability (for instance as model of the evolution of financial products or a biological population) and in the study of probabilities on algebraic structures.

If this process is quite well understood whenever the matrices A_n contract \mathbb{R}^d (i.e. $\|A_n \cdots A_1\| \rightarrow 0$), many problems are still open in the critical case when the matrices A_n neither contract nor dilate, that is when the Lyapunov exponent is zero

$$\lim_{n \rightarrow \infty} \frac{\log \|A_n \cdots A_1\|}{n} = 0.$$

We will investigate conditions for that ensure that the chain X_n do not escape at infinity and prove that the chain is recurrent in several different situation and in particular when the A_n are invertible matrices.

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