AG Analysis & Stochastik

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Almost periodically stationary processes

Abstract:

In this paper, we define a new concept of stationarity, namely almost periodically stationary processes. We call a stochastic process $(X_t)_{t\in\R^d}$ almost periodically stationary if for every $\varepsilon>0$ there exists an L_{ε} and a $\tau(a,\varepsilon)=\tau\in [a,a+L_{\varepsilon}]^d$ for all $a\in\bR^d$ such that
\begin{align*}
d_n(P_{X_{t_1},\dotso,X_{t_n}},P_{X_{t_1+\tau},\dotso,X_{t_n+\tau}})<\varepsilon
\end{align*}
for every $t_1,\dotso,t_n\in\bR^d$, where d_n is the Prokhorov-metric. We derive conditions when the stochastic integral
\begin{align*}
X_t:= \int\limits_{\R^d} f(t,s) dL(s)
\end{align*}
is almost periodically stationary, where $f(t,\cdot)\in L^1(\R^d)\cap L^2(\R^d)$ and L is a L\'evy basis. Furthermore, we discuss almost periodic Ornstein-Uhlenbeck processes and characterize for a submultiplicative function g the uniform integrability of the process $(g(X_t))_{t\in\R^d}$ dependent on the characteristic triplet of an infinitely divisible random field $(X_t)_{t\in\R^d}$.

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