

Year: 2009	Vol.: 75	Fasc.: 1-2
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Title: Linear iterative equations of higher orders and random-valued functions

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Given a probability space $(\Omega, \mathcal{A}, P)$, a separable metric space X with the σ -algebra $\mathcal{B}$ of all its Borel subsets and a $\mathcal{B} \otimes \mathcal{A}$ -measurable $f : X \times \Omega \rightarrow X$ we consider the equation

$$(E) \quad \varphi(x) = \int_{\Omega} \varphi(f(x, \omega)) P(d\omega)$$

and iterates $f^n, n \in \mathbb{N}$, of f defined on $X \times \Omega^{\mathbb{N}}$ by $f^1(x, \omega) = f(x, \omega_1)$ and $f^{n+1}(x, \omega) = f(f^n(x, \omega), \omega_{n+1})$. Assuming that for every $x \in X$ the sequence $(f^n(x, \cdot))_{n \in \mathbb{N}}$ converges in law and $\pi(x, \cdot)$ denotes the limit distribution we show that for every Borel and bounded $u : X \rightarrow \mathbb{R}$ the function $x \mapsto \int_X u(y) \pi(x, dy)$, $x \in X$, is a Borel solution of (E) and we study regularity of these solutions.

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