

APPROXIMATING THE IDENTITY OF CONVOLUTION WITH  
RANDOM MEAN AND RANDOM VARIANCE

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ABSTRACT. We provide sufficient conditions on the profile  $\varphi$ , on the sequence of random variables  $x_j > 0$  and on the sequence of random vectors  $y_j \in \mathbb{R}^n$  such that  $\mathcal{E} \left( \frac{1}{x_j(\omega)} \int_{z \in \mathbb{R}^n} \varphi \left( \frac{|z-x-y_j(\omega)|}{x_j(\omega)} \right) f(z) dz \right) \xrightarrow{j \rightarrow \infty} f(x)$  for almost every  $x \in \mathbb{R}^n$ ,  $f \in L^p(\mathbb{R}^n)$ ,  $1 \leq p \leq \infty$ , where  $\mathcal{E}$  denotes the expectation,  $x_j$  tends to  $0 \in \mathbb{R}$  in law and  $y_j$  tends to  $0 \in \mathbb{R}^n$  in law.