$t^{1/3}$ Superdiffusivity of Finite-Range Asymmetric Exclusion Processes on $\mathbb{Z}$.

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ABSTRACT: We consider finite-range asymmetric exclusion processes on $\mathbb{Z}$ with non-zero drift. The diffusivity $D(t)$ is expected to be of $\mathcal{O}(t^{1/3})$. We prove that $D(t) \geq Ct^{1/3}$ in the weak (Tauberian) sense that $\int_0^\infty e^{-\lambda t} tD(t)dt \geq C\lambda^{-7/3}$ as $\lambda \to 0$. The proof employs the resolvent method to make a direct comparison with the totally asymmetric simple exclusion process, for which the result is a consequence of the scaling limit for the two-point function recently obtained by Ferrari and Spohn. When $p(z) \geq p(-z)$ for each $z > 0$, we show further that $tD(t)$ is monotone, and hence we can conclude that $D(t) \geq Ct^{1/3}(\log t)^{-7/3}$ in the usual sense.