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Can MSbar parton distributions be negative?

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It is common lore that Parton Distribution Functions (PDFs) in the $\overline{\text{MS}}$ factorization scheme can become negative beyond leading order due to the collinear subtraction which is needed in order to define partonic cross sections. We show that this is in fact not the case and next-to-leading order (NLO) $\overline{\text{MS}}$ PDFs are actually positive in the perturbative regime. In order to prove this, we modify the subtraction prescription, and perform the collinear subtraction in such a way that partonic cross sections remain positive. This defines a factorization scheme in which PDFs are positive. We then show that positivity of the PDFs is preserved when transforming from this scheme to $\overline{\text{MS}}$, provided only the strong coupling is in the perturbative regime, such that the NLO scheme change is smaller than the LO term.

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