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Improved determination of d(x) – u(x) flavor asymmetry in the proton by data from the BONuS experiment at JLAB and using an approach by Brodsky, Hoyer, Peterson, and Sakai

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The experimental data taken from both Drell-Yan and deep-inelastic scattering (DIS) experiments
suggest a sign-change in $\bar{d}(x) - \bar{u}(x)$ flavor asymmetry in the proton at large values of momentum fraction x.
In this work, we present a phenomenological study of $\bar{d}(x) - \bar{u}(x)$ flavor asymmetry.
First, we extract the $\bar{d}(x) - \bar{u}(x)$ distribution using the more recent data from the BONuS experiment at Jefferson Lab on the ratio of neutron to proton structure functions, F_2^n / F_2^p,
and show that it undergoes a sing-change and becomes negative at large values of momentum fraction x, as expected.
The stability and reliability of our obtained results have been examined by including target mass corrections (TMCs) as well as higher twist (HT) terms which are particularly important
at the large-x region at low Q^2.
Then, we calculate the $\bar{d}(x) - \bar{u}(x)$ distribution
using the Brodsky, Hoyer, Peterson, and Sakai (BHPS) model and show that if one chooses a mass for the down quark smaller than the one for the up quark it leads to a better description for the Fermilab E866 data. In order to prove this claim, we determine the masses of down and up sea quarks by fitting to the available and up-to-date experimental data for the $\bar{d}(x) - \bar{u}(x)$ distribution. In this respect, unlike the previous performed theoretical studies, we have shown that this distribution has a sign-change at $x > 0.3$ after evolution to the scale of available experimental data.

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