We propose a novel class of Hawkes-based model that assesses two types of systemic risk in high-frequency price processes: the endogenous systemic risk within a single process and the interactive systemic risk between a couple of processes. We examine the existence of systemic risk at a microscopic level via an empirical analysis of the futures markets of the West Texas Intermediate (WTI) crude oil and gasoline and perform a comparative analysis with the conditional value-at-risk as a benchmark measure of the proposed model. Throughout the analysis, we uncover remarkable empirical findings in terms of the high-frequency structure of the two markets: for the past decade, the level of endogenous systemic risk in the WTI market was significantly higher than that in the gasoline market. Moreover, the level at which the gasoline price affects the WTI price was constantly higher than in the opposite case. Although the two prices interact with each other at the transaction-unit level, the degree of relative influences on the two markets, that is, from the WTI to the gasoline and vice versa, was very asymmetric, but that difference has reduced gradually over time. (Received February 03, 2020)