Recent literature on high frequency financial data includes models that use the difference of two Poisson processes and incorporate a Skellam distribution for forward prices. The exponential distribution of inter-arrival times in these models is not always supported by the data. Fractional generalization of the Poisson process, or fractional Poisson process, overcomes this limitation and has Mittag-Leffler distribution of inter-arrival times. This paper defines fractional Skellam processes via the time changes in Poisson and Skellam processes by an inverse of a standard stable subordinator. An application to high frequency financial data set is provided to illustrate the advantages of models based on the fractional Skellam processes. (Received August 20, 2015)