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In this work, we build a trend following algorithm based on the sequential statistical rule known as the cumulative sum (CUSUM), which has traditionally been used for the online detection of abrupt changes in the distribution of sequences of observations. We draw connections between these statistics and the problem of online statistical surveillance and quality control, which dates back to the 1930s. We build a trading strategy based on the CUSUM stopping rule and apply it to high-frequency tick data from 5-year and 30-year US Treasury notes sold at auction. We analyze the performance of the proposed trend following strategy in detail. In particular, it is seen that the proposed trading rule is most profitable during times of market instability and long trends. We further calculate in closed form the expected value of the gain of the proposed strategy for a class of random walk models. Not surprisingly, it is seen that the suggested strategy is most profitable in biased random walks but is indifferent to the direction of the bias. We also examine the performance of the proposed strategy in simulated data from a variety of random walk models and analyze this behavior in relation to the analytical results and the results of the performance of the strategy on the actual data. (Received August 19, 2013)