This research work, proposes forecasting stock prices in the stock market industry in Nigeria using a Weightless Neural Network (WNN). A neural network application used to demonstrate the application of the WNN in the forecasting of stock prices in the market is designed and implemented in Visual Foxpro 6.0. The proposed network is tested with stock data obtained from the Nigeria Stock Exchange. This system is compared with Single Exponential Smoothing (SES) model. The WNN error value is found to be 0.39 while that of SES is 9.78, based on these values, forecasting with the WNN is observed to be more accurate and closer to the real data than those using the SES model.