This paper presents the Threshold Recurrent Reinforcement Learning (TRRL) model, a regime-switching version of the RRL algorithm, originally proposed by Moody and Wu (Proc. IEEE/IAFE 1997,300-307), in the context of automated trading. We argue that the TRRL is better equipped to capture the non-linearities present in financial data than the standard RRL. We perform controlled experiments using artificially generated data to compare the performance of the standard RRL with a two-regime TRRL model. We find that the TRRL is at least as good as the standard model in single-regime scenarios, but is significantly better in situations when the data comes from distinct regimes. We also compare the performance of the two models using daily data from four well-known European indices. We assume a frictionless setting and use volatility as an indicator variable for switching between regimes. We find that the TRRL produces better trading strategies in all the cases studied, and demonstrate that it is more apt at finding structure in non-linear financial time series than the standard RRL.