Subspace tracking using low-complexity methods is a common research area in signal processing. While numerical properties of available methods are extensively addressed in literature, there is a paucity of statistical results on limiting behavior of subspace tracking methods. In this contribution, we will study steady-state error of DPM, MALASE, Champagne's PA, Karasalo, and PAST methods. We show that DPM, MALASE, and PAST are approximations of the PA method, while Karasalo's method is equivalent to the PA method in convergence region. A tradeoff between steady-state error of methods and their local convergence rate is demonstrated. A nonstationary signal model is assumed, in which true subspace is slowly and randomly varying. Simulation results show PA and PAST are asymptotically close to the optimum sample covariance matrix (SCM), while this is not true for DPM and MALASE in stationary signal case. In the steady state, these methods can be expressed with a unified approach using stochastic first-order difference equations, whose fixed points are calculated. The results can be used to determine optimal step-size in terms of tolerable total signal subspace projection error. Simulation results confirm the validity of theoretical error calculations.