

Alexei Onatski

Title: Asymptotics of the principal components estimator of large factor models with weak factors"

Abstract: We consider large factor models where factors' explanatory power does not strongly dominate the explanatory power of the idiosyncratic terms in finite samples, which is the situation often observed in the empirical applications. To study the principal components (PC) estimator of such a weak factors, we introduce a Pitman-drift-like asymptotic device, which we call weak factors asymptotics. We find the probability limits of the PC estimator under weak factors asymptotics when the idiosyncratic terms can be both cross-sectionally and temporally correlated. We show that the probability limits may be drastically different from the true factors and factor loadings even for factors with substantial explanatory power. For a special case of no cross-sectional and temporal correlation of the idiosyncratic terms, we establish the second order weak factors asymptotics of the PC estimator. The estimator is asymptotically normal with the covariance matrix depending on the strength of the factors and on the ratio of the cross-sectional and the temporal dimensions of the data.