Edgeworth-type expansions for weakly convergent nonhomogeneous Markov chains

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We consider triangular arrays of Markov chains that converge weakly to a diffusion process. Second order Edgeworth type expansions for transition densities are proved. The paper differs from recent results in two respects. We allow nonhomogeneous diffusion limits and we treat transition densities with time lag converging to zero. Small time asymptotics are motivated by statistical applications and by resulting approximations for the joint density of Markov processes and diffusion values at an increasing grid of points: Assume that one observes a Markov process $X_{1,h}, ..., X_{nk,h}$ at time points $k, 2k, ..., nk$. That means we assume that a high frequency Markov chain runs in the background on a very fine time grid but that it is only observed on a coarser grid. This asymptotics reflects a set up occurring in the high frequency statistical analysis for financial data where diffusion approximations are used only for coarser time scales. We will argue that the L_1-distance between the joint distribution of the Markov process and the distribution of the discretized diffusion limit converges to zero. Such a result would imply that the LeCam deficiency distance between the statistical Markov experiment and its diffusion limit converges to zero. The talk reports on joint work with Valentin Konakov and Jeanette Woerner.